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FINAL REPORT

LOS ANGELES TRANSIT ORIENTED DEVELOPMENT PARKING AND UTILIZATION CASE STUDIES COMPASS BLUEPRINT DEMONSTRATION PROJECT

Submitted by:

ITERIS® Innovation for better mobility

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FINAL REPORT

Los Angeles Transit Oriented Development Parking and Utilization Case Studies Compass Blueprint Demonstration Project Los Angeles, California

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This is a project of the City of Los Angeles with funding provided by the Southern California Association of Governments' (SCAG) Compass Blueprint Program. Compass Blueprint assists Southern California cities and other organizations in evaluating planning options and stimulating development consistent with the region's goals. Compass Blueprint tools support visioning efforts, infill analyses, economic and policy analyses, and marketing and communication programs. The preparation of this report was funded in part through grant(s) from the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) through the United States Department of Transportation (DOT) in accordance with the Metropolitan Planning Program as set forth in Section 104(f) of Title 23 of the U.S. Code. Additional funding was provided through a grant from the California Strategic Growth Council.

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Chapter 1 Introduction and Background

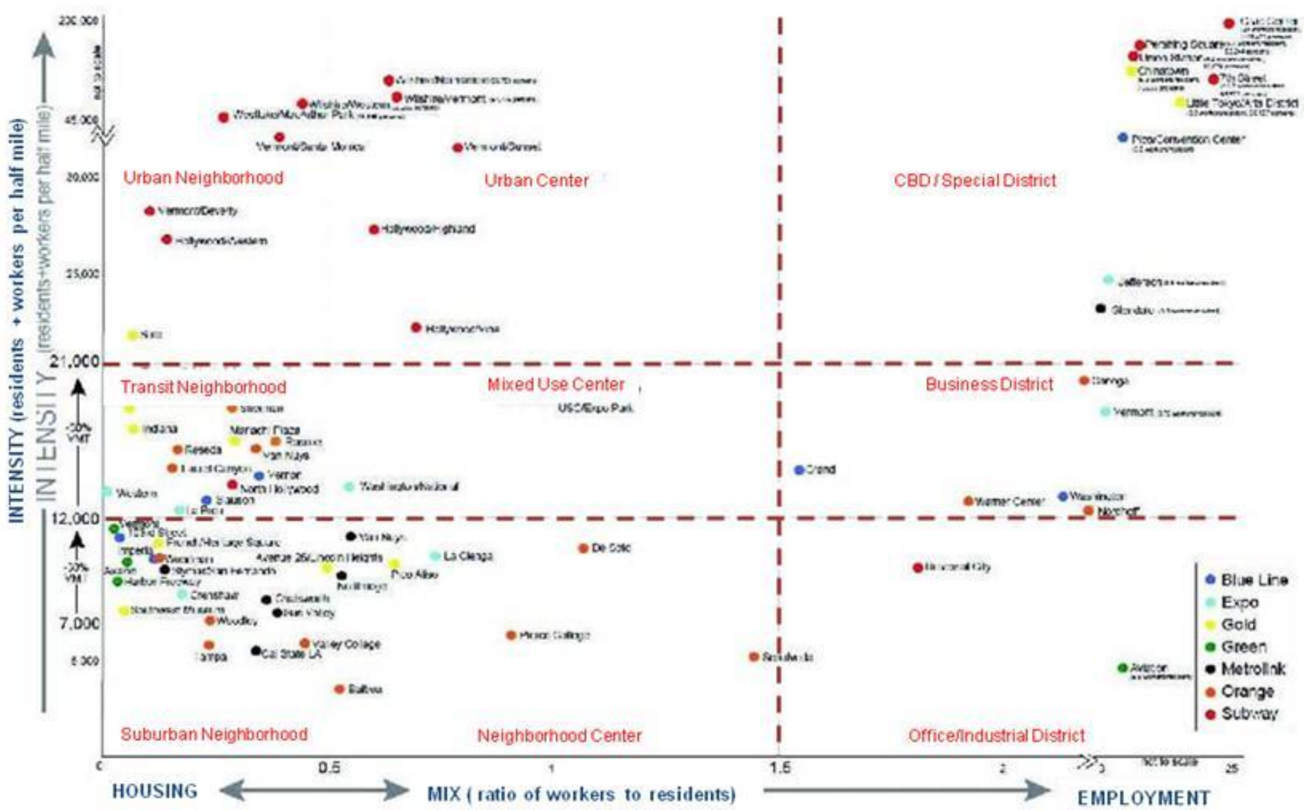
This report presents the results of a project sponsored by the Southern California Association of Governments (SCAG) as part of its Compass Blueprint program to investigate parking supplies and utilization at case study locations within the City of Los Angeles around transit-oriented districts(TODs). Iteris, Inc. was chosen to conduct the technical analysis and the consultant team was guided by a Technical Advisory Committee (TAC) consisting of representatives of SCAG and the City of Los Angeles. The scope of work included research, extensive in-field observations, parking counts, interviews, surveys and analysis of the collected information. Note that the terms Transit Oriented "Districts" and Transit Oriented "Developments" are often used interchangeably when referring to transit oriented land uses and areas surrounding transit hubs. The term Transit Oriented Development is often associated with a single unified development project that incorporates elements to enhance transit usage and are located near a transit facility. Transit Oriented District typically refers to an area that has been built up over time near a transit facility and consists of multiple land owners and different public and private developments. Since this study addresses all land uses within one-eighth of a mile of the selected transit stations, the term District is most appropriate to describe the TOD locations, but District and Development are both used in the report.

With Senate Bill 375 and the Complete Streets Act of 2008, the City of Los Angeles must implement policies to reduce dependence on the single-occupancy vehicle and greenhouse gas emissions. The policy focus on improving the quality of life and reducing dependence on the automobile is not new for the City of Los Angeles. The City's 1993 Land Use and Transportation Policy (LUTP) calls for the adoption of parking requirements appropriate to transit-oriented districts including the establishment of minimum and maximum on-site parking ratios for new development adjacent to the transit stations. The LUTP calls for the concentration of mixed commercial/residential uses, neighborhood-oriented retail, employment opportunities, and civic and quasi-public uses around transit stations, while protecting and preserving surrounding low density neighborhoods from encroachment of incompatible land uses. The intent of the LUTP is to encourage cycling, public transit ridership and pedestrian access, and to reduce parking and automobile reliance.

Dspite the innovative policies embraced by the LUTP, parking standards in the areas adjacent to the city's high-density stations remain the same today as those of low-density neighborhoods. In response to this, the project studied existing parking conditions and utilization to better inform policy options for revised parking requirements in developments at and near the city's transit stations. Matching the City's parking policies at the transit stations to the particular area's needs will promote the reduction of vehicular use in and around transit stations, encourage transit ridership, facilitate an increase in pedestrian and bicycle trips, reduce housing costs, increase opportunities for new businesses to relocate within transit districts, reduce development costs, increase access to shared vehicles, and reduce the need for car ownership.

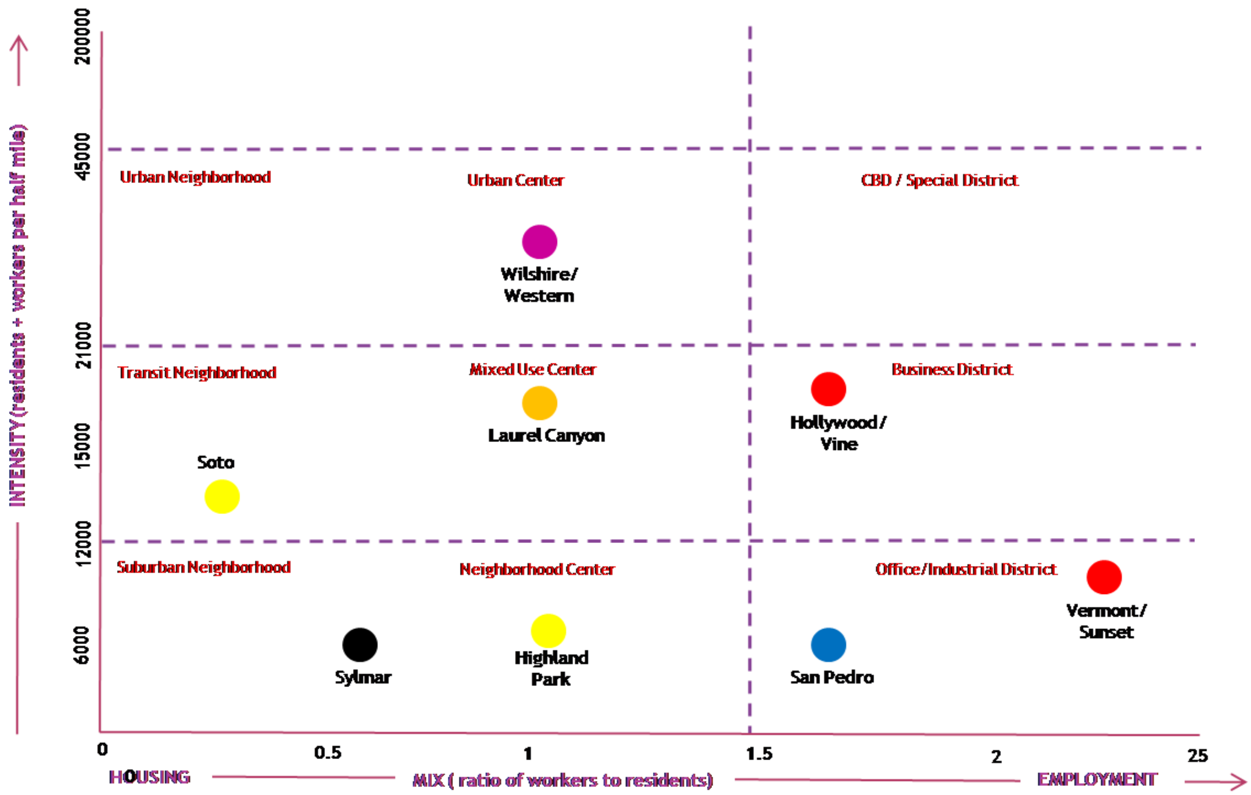
Figure 1 displays all City of Los Angeles TOD stations and their place types, and **Figure 2** shows the eight case study locations and where they fall within the place type hierarchy. This study originally proposed to examine the impacts of parking capacity at up to six transit stations in the city, chosen based on their place types, however, the number of case studies was expanded to eight locations prior to beginning work. The study evaluated the existing parking capacity and demand in public parking lots, on-street parking spaces and private developments within an eighth of a mile around the chosen stations. The stations selected by the Technical Advisory Committee (TAC) were based on the types by intensity and land use mix and covered a wide geography of the city. The results of this evaluation will guide the City in choosing a policy course for parking requirements in developments at and near the City's 74 existing and 15 future transit stations. **Figure 3** highlights the locations of the stations that were studied.

Figure 1: TOD Station Place Types by Intensity and Land Use Mix



Source: Center for Transit-Oriented Development, US Census 2000, US Census Longitudinal Employment-Household Dynamics 2004

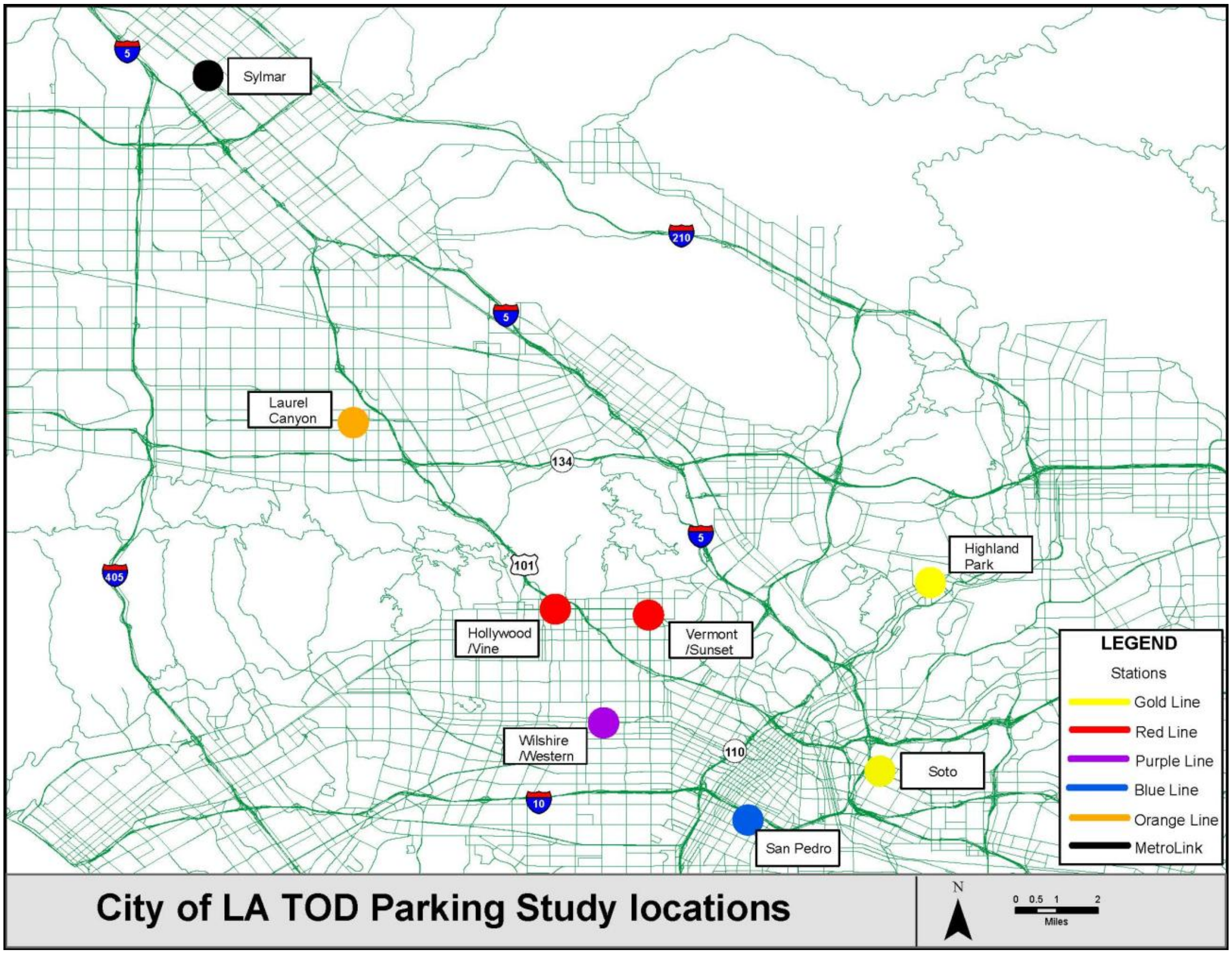
Figure 2: Selected Eight TOD Stations by Intensity and Land Use Mix



Source: Center for Transit-Oriented Development, US Census 2000, US Census Longitudinal Employment-Household Dynamics 2004

The map in **Figure 3** shows the location of eight study areas that were selected as part of the project. As seen from the map, the study areas cover a wide geography in the City of Los Angeles.

Figure 3: Project Map of the Study Areas



The following key tasks were undertaken by the project team under the guidance of the Technical Advisory Committee:

Survey of Research and Best Practices

As part of this project, Iteris reviewed, synthesized and analyzed parking and transit oriented district research and best practices nationwide. The research included parking generation, standards, parking costs and needs in transit-oriented districts. Also looked at were incentives and disincentives used by other jurisdictions to impact the provision of parking. The research and best practices review did not only look at studies that addressed parking and TOD areas, but also included review of many other TOD related parking studies such as those that addressed the relationship of TODs to auto ownership, income, trip generation, parking rates, pricing strategies, parking regulations, land use, and travel behavior.

Analysis of Existing Standards

Iteris reviewed existing parking standards and parking costs used in the City of Los Angeles in general and specifically in the station areas under study. Issues reviewed included existing parking standards, parking costs, and practices used in the City of Los Angeles.

Inventory of Existing Parking Supply and Associated Parking Cost

Iteris conducted a detailed inventory of existing public on- and off-street parking facilities and existing public and private off-street parking facilities within an eighth mile of the transit stops. Associated parking costs for the variety of parking facilities were also surveyed. Existing city data was used along with information provided by contacting property managers and conducting numerous field visits to verify information. GIS maps of station areas under study were created, including details of parking in developments where parking supply generally exceeds 50 spaces (where it was feasible to collect the information). The GIS based maps also indicate proximity of the various parking lots to the rail station sites. Also as part of this project, Iteris collected detailed information for each station area that included land use by type, population, employment, number of dwelling units, parking regulations and transit information for each TOD such as boardings, alightings and frequency of service.

Parking Generation and Utilization Surveys

The team conducted detailed utilization surveys of public on- and off-street parking facilities and select private off-street parking facilities within an eighth mile of the transit stops. The purpose of the utilization surveys was to understand how well used the parking supply is in each case study area, and then to compare those results to the other characteristics of each area. Parking utilization was done by manually observing parking locations during various hours of the day and counting how many parking spaces are occupied or empty. For all study areas it was possible to count all of the public on-street spaces and observe utilization. For the off-street parking, all public parking could be counted; however, selected private off-street parking utilization data were not obtained because some parking areas are privately owned and some parking operators do not allow counts at their facilities. Several attempts were made to contact private operators to maximize the number of spaces included in the utilization surveys. In many cases, even where access was not granted, the team was able to use other means to obtain utilization data such as observing occupancy from outside the lots.

Conduct Focused Outreach

Focused outreach was performed as part of the project including “man on the street” surveys at the Wilshire Western site, interviews with employers and parking operators at the Vermont/Sunset site and interviews with multiple parking operators throughout the eight case study locations.

Chapter 2 - Summary and Key Findings

This report presents the results of the Compass Blueprint project covering Parking Supply and Utilization Case Studies in the City of Los Angeles Transit-oriented Districts. The study effort has included several key work tasks including the following:

- Research on TOD Best Practices
- Review of City of Los Angeles Parking Standards
- Parking inventory at eight TOD locations
- Review of parking pricing at eight TOD locations
- Parking Utilization studies at eight TOD locations
- Parking Demand Model estimates of parking supply and demand at eight TOD locations
- On-street surveys regarding parking and transit usage at one study location
- Interview with major employer (Kaiser Hospital) at one TOD location (Vermont/Sunset)

The study has yielded a significant amount of information at the eight chosen TOD case study locations in the City of Los Angeles. The goals of the study include providing data and information relating to parking and transit to help the City make future decisions regarding parking standards and policies at TOD locations. The study is intended to provide the background and analysis to enable the City to start to form recommendations and adopt new parking policies and standards for varying types of transit station areas, thereby providing mobility, livability, prosperity and sustainability benefits by reducing the reliance on single occupant automobiles.

Because this study covers eight out of over 100 TOD locations in the City, there are not definitive findings that cover all types of TOD areas. Additional research and empirical data collection is encouraged to develop final recommendations regarding the relationship of parking and transit usage in Los Angeles. However, the information developed by this effort will help the City to begin to formulate policy recommendations related to transit oriented districts. Key findings are discussed below.

Table 1 summarizes key measurements for the eight case study locations and compares the locations to each other. This information is presented to help understand each case study location in terms of parking and transit characteristics as well as land use and to present a comparative summary. The results of this project have revealed widely varying characteristics of the eight TOD locations, but three of the studied TOD areas stand out from the rest in terms of several key indicators. Finally, TOD research strongly indicates that TOD policy formation must be accomplished area-by-area due to the unique characteristics of each TODs. Thus, an understanding of the comparative characteristics of each area is important to help apply the findings of this study.

The following types of information are compared in Table 1 for the various TOD locations:

- <u>Place Type (typology)</u> – indicates which place type the TOD area falls within.
- <u>Density of Activity</u>– indicates how dense the area is in terms of a combination of population and employment. The density ranges from a low total combined sum of population and

employment of 1,564 jobs and people at the San Pedro station, to a high of 3,785 jobs and people at Soto.

- Off-street Parking Supply – off-street supply ranges from a low of 418 spaces at Soto to 3,774 spaces at Wilshire/Western.
- Measured Parking Demand – this is summarized for both on-street spaces (all eight locations) as well as off-street spaces at selected locations
- Estimated Parking Demand – this is based on the parking demand model and estimates the theoretical parking demand based on land use characteristics as compared to parking supply. It indicates whether each area is theoretically under parked, over parked or has about the right amount of parking.
- Parking Fees – characterizes the parking fee structure in each area for off-street parking.
- Rail Transit Usage – characterizes the level of rail transit usage at each TOD location based upon data from Metro and Metrolink. There is additional transit ridership on local buses that is not accounted for in this summary.

For the measured categories, each station is ranked as “High,” “Moderate” or “Low.” These rankings are in absolute terms as well as comparative among the eight areas. For example, for Rail Transit Usage, three areas are ranked as “High” with over 9,000 rail riders per day. Two areas fall within the “Moderate” range with approximately 4,000 rail riders per day, and the remainder are in the “Low” category with fewer than 2,500 rail riders per day (just over 1,000 in the case of the Sylmar station). Similarly, for the “Density” category, areas with a combined total of 3,000 or more (population + jobs) are ranked as “High,” those with about 2,500 ranked as “Moderate,” and those with 1,500 to 1,800 ranked as “Low” (these can be reasonably compared since the study area size is standardized to the 1/8 mile radius in all areas). For off-street parking, “High” is defined as areas with between 2,300 and 3,700 off-street spaces, “Moderate” includes areas with approximately 800 to 900 spaces, and “Low” are the TOD areas with about 400 to 600 spaces. Parking demand is more fully explained within the report, but the “High” ranking generally relates to observed parking of at least 70 to 80 percent utilized during the peak hours. Parking fees are more difficult to categorize and rank due to the large variation in off-street fees; however, two areas clearly stand out with much higher fees than the other case study areas: Hollywood/Vine and Wilshire/Western. The other measures were similarly broken down and categorized based on the data results.

A review of the summary reveals a few clear trends. Three case study areas stand out from the others in terms of multiple characteristics such as density, parking supply, parking demand, parking fees and rail transit usage. The three areas are Hollywood/Vine, Vermont/Sunset and Wilshire Western. Other TOD areas score high in some categories, but lower in others such as Soto, which has a large population and employment base and moderate to high parking demand, but lower transit ridership.

The findings presented in Table 1 and throughout this report are generally consistent with other research into TOD areas and parking supply. For example, the areas with the largest parking utilization (Hollywood/Vine, Wilshire/Western) also have the highest parking fee rates, reflecting the market response to parking supply and demand (Vermont/Sunset was the exception, although the parking fees in this TOD are kept artificially low by the hospitals for the benefits of their clients and staff). Also, these same three TOD case study areas have the highest transit ridership, indicating a potential relationship between lack of parking, parking fees and mode share.

As with other research efforts, it is difficult to identify the causality and interrelationships between parking supply in and near the TOD and transit mode share. However, the data presented in this report provides much information to consider in future policy recommendations relating to parking codes, parking rate structures, management of parking assets, transit incentive programs and public/private partnerships in TOD areas. A common theme in prior research was also identified by the work undertaken for this study: a "one size fits all" approach to TOD parking policy is not appropriate due to the inherent differences in TODs throughout the City. The report provides detailed information on each case study area to help understand each area with respect to parking as well as transit mode share and other TOD characteristics.

Table 1: TOD Case Study Area Summary

Case Study Area	TOD Area Typology	Transit Line	Density (Population + Employment)	Off-Street Parking Supply	Observed Parking Demand		Estimated Parking Demand VS. Supply	Parking Fees	Rail Transit Usage
					On-Street	Off-Street			
Highland Park	Neighborhood Center	Gold Line	**High**	Mod.	Low	Low	Even	Low	Mod.
Hollywood/Vine	Business District	Red Line	**High**	**High**	**High**	Mod./**High**	Excess Supply	**High**	**High**
Laurel Canyon	Mixed use Center	Orange Line	Mod.	Mod.	Low	Low	Even	None	Low
San Pedro	Office-Industrial	Blue Line	Low	Low	Low	Mod.	Excess Demand	None	Mod.
Soto	Transit Neighborhood	Gold Line	**High**	Low	Mod./**High**	-	Even	Low	Low
Sylmar	Suburban Neighborhood	Metrolink	Low	Mod.	Low	Mod.	Even	None	Low
Vermont/Sunset	Office-Industrial	Red Line	Mod.	**High**	**High**	**High**	Excess Demand	Mod.	**High**
Wilshire/Western	Urban Center	Purple Line	**High**	**High**	**High**	Mod.	Excess Supply	**High**	**High**

High – Case Study area scored "high" in this category
Mod. – Case study area scored "moderate" in this category
Low – Case study area scored "low" in this category

Area-by-area descriptions of the key characteristics and study findings for each of the TOD case study areas are provided below. Further detailed area-by-area summaries are provided in the remainder of the document.

Highland Park (Gold Line)

This station is within the Highland Park neighborhood and within the "Neighborhood Center" TOD station place typology. It is served by the Metro Gold Line, with approximately 3,860 transit boardings and alightings per weekday and six minute peak hour transit service headway. The station area land uses are approximately half residential, with the rest commercial (35percent) and some open space. There is an equal balance of population and employment in this study area, indicating that the transit serves both home-based trips as well as trips to work. The off-street parking supply is relatively small compared to the other study areas. In terms of parking utilization, the on-street peak time period parking demand is relatively low at only 54 percent of spaces used (during the PM peak) and remains relatively consistent all day until dropping to below 40 percent at night. Similarly, the off-street parking that was surveyed was only 47 percent utilized during the peak time period (during the mid-day peak). Parking fees are charged in this area, including $1/hour at the parking meters and relatively low fees of $0.25/30 minutes with a $2.50 maximum at selected off-street lots.

Hollywood/Vine (Red Line)

This station is within the Hollywood/Vine neighborhood and within the "Business District" TOD station place typology. It is served by the Metro Red Line, with approximately 10,800 transit boardings and alightings per weekday and a ten minute peak hour transit service headway. The station area land uses are approximately 70 percent commercial, 20 percent residential, with a small amount of manufacturing and some open space. There is more employment than population but it is still a relatively balanced area with 1,900 jobs as compared to 1,200 residents, indicating that transit serves both home-based trips as well as trips to work. The off-street parking supply is relatively large compared to the other study areas (third largest off-street supply). In terms of parking utilization, the on-street peak time period parking demand is extremely high at 98 percent of spaces used during the nighttime peak and approaching 80 percent during the PM peak. Similarly, the off-street parking surveyed was also in high demand at 78 percent utilized during the peak time period (nighttime peak). Relatively higher parking fees are charged in this area, including $2/hour at the parking meters (the only case study area with a $2 fee) and a range of fees at the off-street lots with a peak of $25/day observed and many lots with $10 or $15 flat fees.

Laurel Canyon (Orange Line)

This station is within the Laurel Canyon neighborhood and within the "Mixed Use Center" TOD station place typology. It is served by the Metro Orange Line, with approximately 2,460 transit boardings and alightings per weekday and a four minute peak hour transit service headway. The station area land uses are approximately 75 percent residential, 20 percent commercial and some open space. Even with this land use mix, there is more employment than population, but it is still relatively balanced with 1,300 jobs as compared to 1,100 residents, indicating that transit serves both home-based trips as well as trips to work. The off-street parking supply is relatively small compared to the other study areas. In terms of parking utilization, the on-street peak time period parking demand is low at 55 percent of spaces used (during the AM peak). Similarly, the off-street parking that was surveyed was also low at 23 percent utilized during the peak time period (during the AM peak). There are no parking fees charged in this area either on-street or off-street.

San Pedro (Blue Line)

This station is within the San Pedro neighborhood and within the "Office/Industrial District" TOD station place typology. It is served by the Metro Blue Line, with approximately 4,175 transit boardings and alightings per weekday and a seven minute peak hour transit service headway. The station area land uses are approximately 25 percent residential, 10 percent commercial, 50 percent industrial/manufacturing and some open space. With this land use mix, there is a very even balance of population and employment, with 800 jobs as compared to 750 residents, indicating that transit serves both home-based trips as well as trips to work. The off-street parking supply is very small compared to the other study areas (it is the second smallest off-street parking supply of all eight case study areas). In terms of parking utilization, the on-street peak time period parking demand is low at 55 percent of spaces used (during the mid-day peak). The off-street parking that was surveyed has a peak demand of 61 percent utilized during the mid-day. There are no parking fees charged in this area either on-street or off-street.

Soto (Gold Line)

This station is within the Soto neighborhood and within the "Transit Neighborhood" TOD station place typology. It is served by the Metro Gold Line, with approximately 2,400 transit boardings and alightings per weekday and a six minute peak hour transit service headway. The station area land uses are residentially oriented, with 65 percent of the land use dedicated to residential, 30 percent commercial and some open space. This station has the largest population base of all of the eight case studies, with approximately 2,400 residents as compared to about 1,400 jobs. With this land use mix, there is a higher demand for home-based trips on the Gold line, with a lesser number of work and other trips serving the employment base. The off-street parking supply is the smallest of all of the study areas, with just over 400 off-street spaces. In terms of parking utilization, the on-street peak time period parking demand is relatively high at 79 percent of spaces used (during the nighttime peak). Due to the nature of this study area with a preponderance of residential uses and only smaller off-street parking lots, no off-street parking was surveyed. There are meter parking fees charged in this area of $1/hour, but no fees for off-street parking were observed.

Sylmar (Metrolink)

This station is within the Sylmar neighborhood and within the "Suburban Neighborhood" TOD station place typology. It is served by the Metrolink service, with approximately 1,020 transit boardings and alightings per weekday (the lowest ridership of all of the case study areas) and a one hour transit service headway. The station area land uses are residentially oriented, with 50 percent of the land use dedicated to residential, 25 percent commercial, 5 percent to Industrial/Manufacturing and 20 percent to open space. This station has a population base of just over 1,000 and approximately 800 employees. The off-street parking supply is relatively small compared to the other study areas; however, this is the only location with dedicated transit parking, a 338 space Metrolink parking lot. In terms of parking utilization, the on-street peak time period parking demand is very low at only 37 percent of spaces used (during the AM peak). The off-street parking survey included the Metrolink lot. That survey revealed that the Metrolink station parking reaches peak occupancy of 64 percent during the AM period. There are no meter parking fees charged in this area nor are there any fees for off-street parking.

Vermont/Sunset (Red Line)

This station is within the Vermont/Sunset neighborhood and within the "Office/Industrial" TOD station place typology. It is served by the Metro Red Line, with approximately 9,500 transit boardings and alightings per weekday and a ten minute peak hour transit service headway. The station area land uses are largely commercial and medical facility oriented, with 35 percent of the land use dedicated to commercial uses, 15 percent to residential and 50 percent to public facilities (in this case the public facilities are hospital uses). This station has the smallest population base of all of the eight case studies, with only 400 residents but nearly 2,200 jobs (the largest employment base of all of the case studies). With this land use mix, there is a much higher demand for work-related trips on the Red Line, with a small number of home-based trips serving the small population base. The off-street parking supply is very large compared to the other study areas (second largest of the eight areas) due to the large lots needed to serve the hospitals (Kaiser and Children's). In terms of parking utilization, the on-street peak time period parking demand is extremely high as Kaiser effectively uses all of their available parking during peak time periods (Kaiser employs "stack" parking techniques to increase available parking beyond striped spaces plus they lease additional parking from other nearby locations to supplement their parking shortage). The on-street parking utilization peaked at 88 percent during the AM time period and it is nearly as high mid-day, indicating that the on-street supply is extremely well used. Parking fees charged in this area include $1/hour meter fees and off-street fees ranging up to $4 maximum. Kaiser recently revised their fee structure; however, the Kaiser philosophy is to keep parking rates affordable for patients and visitors and Kaiser does not charge employees for parking.

Wilshire/Western (Purple Line)

This station is within the Wilshire/Western neighborhood and within the "Urban Center" TOD station place typology. It is served by the Metro Purple Line, with approximately 9,250 transit boardings and alightings per weekday and a ten minute peak hour transit service headway. The station area land uses are commercially oriented, with 80 percent of the land use dedicated to commercial (mostly office uses), and 20 percent residential. This station has the second largest employment population base of all of the eight case studies, with approximately 2,000 jobs, but it also has a significant population base of nearly 1,400 residents. The off-street parking supply is the largest of all of the eight study areas, with nearly 3,800 spaces. The parking spaces in this area are predominantly commercial, with about 25 percent of the spaces for residential uses and 75 percent for commercial. Of the commercial spaces, approximately 45 percent of those are for office uses and the remainder for theater (Wiltern), government, restaurant and retail uses. In terms of parking utilization, the on-street peak time period parking demand is extremely high at 97 percent of spaces used (during the night time), and it also exceeds 70 percent during the mid-day and PM periods. The off-street parking utilization reaches a peak of 71 percent during the mid-day. Meter parking fees charged are $1/hour, and there are off-street fees that are typically $4 to $8 per hour with daily maximums around $15.

Survey of Research and Best Practices

The task covering Research and Best Practices yielded a significant amount of information related to national research and analysis on TOD areas. Limited research has been conducted in TOD areas specifically related to the relationship between overall parking supplies and transit usage in TOD locations. Several academic studies on the relationship between TOD parking and transit usage have failed to find statistically significant correlations between parking supply and journey to work transit shares. Prior research on parking and TODs focused on the parking supply of TOD-oriented developments, not the supply from older buildings and off-street parking in the *vicinity* of the TOD. Prior studies have found that projects with higher levels of transit use did not have statistically significant lower parking supplies; however, those studies were not able to factor in on-street parking or other nearby parking supplies. Studies have found that free parking at work is a significant predictor of mode share.

Much of the other research relating to TOD areas has focused on such variables and relationships as land use mix, land use density, auto ownership, income and other topics. However, there has been some research into parking at TOD locations and providing important information that can be used in the City of Los Angeles. Some key findings from the research review include:

- TOD households tend to be smaller and own fewer vehicles, although the causality is not known. For example, do people move to such projects because they own fewer vehicles or do the TOD developments become “self selecting” where people who want to ride transit and would otherwise own fewer vehicles anyway, choose to live?
- There is a demonstrated potential for reduced parking in TODs, but research indicates this is often a site-by-site determination and may not be amenable to blanket polices since land uses differ considerably from station area to station area.
- Reduced parking is less likely to help transit usage in higher income TOD areas, more likely to increase transit use in lower income and rental-housing dominated TODs.
- Employees are more likely to commute by transit if they are forced to pay for parking at work.
- TOD office buildings use a variety of parking arrangements, including “unbundling” of parking from leases.
- Demand responsive pricing and eliminating long term parking discounts can help to reduce parking demand in TOD areas.
- Parking elasticity indicates that a 10 percent increase in parking price corresponds to a one percent to three percent reduction in vehicle trips.
- Quality of transit services is very important in terms of getting people to take transit and not park, and this is also a site-specific variable since the type and level of transit varies considerably from one TOD area to another.
- Reduced parking at TODs has many benefits including lower construction costs, more affordable housing, reduces local traffic, reduction in urban water runoff due to less paved parking area.

- Worksite parking fees can have a strong affect on mode choice.
- Higher residential and employment density encourages transit use.
- Mix of land uses is critical to transit use at TOD areas.
- Amount of transit usage at TOD areas depends on density, access to transit, transit mode and mix of uses.

Existing Parking Standards and Pricing at City of Los Angles Standards at Case Study Locations

On-street parking meter pricing in the surveyed TOD areas currently ranges from no cost at three of the TOD areas to between $1 to $2 per hour at the remaining areas. Hollywood/Vine is the only station area with a $2/hour meter fee, with the rest at $1/hour. Time limits are generally one to two hours maximum.

Off-street parking regulations in the TOD areas are similar to the rest of the City. There are some special overlay zones including Community Redevelopment Agency zones, but they generally follow the same parking code and regulations as the rest of the City of Los Angeles. In summary, there are no special parking requirements around the case study TOD areas at the current time. Typical parking requirements include:

- Retail – 1 space per 250 SF
- Office – 1 space per 500 SF
- Medial office – 1 space per 200 SF
- Hospital – 2 spaces per bed
- Warehouse – 1 space per 500 SF
- Other commercial – 1 space per 500 SF
- Single Family Dwelling – 2 spaces
- Two-family Dwelling or Apartment – 2 spaces, varies depending on number of habitable rooms

Generally, these typical parking code requirements would neither encourage nor discourage transit usage around TODs since they provide the same parking as in any other part of the City or even in most areas of southern California. Use of transit and reduction in trip generation typically are associated with less free parking or higher parking fees, or both in addition to other actions such as effective transportation demand management. The parking standards in these areas provide for regular code parking which is supportive of typical urban environments with ample parking (often free or subsidized by the land owner) and associated lower transit share.

Inventory of Existing Parking Supply, Parking Costs and Parking Demand Estimates

- Off street private parking costs were observed ranging from $0.50 per hour in Highland Park up to $7.50 per hour in Wilshire Western. Hollywood/Vine also has some parking at $6.75 per hour. These rates are clearly reflective of the demand for parking in the respective study areas.

- On-street parking supply ranges from a low of 144 spaces at Wilshire/Western to a high of 670 spaces at Sylmar, with a median of 350 on-street spaces within the 1/8 study area radius.

- Off-street parking is mostly privately owned and operated; however there are a few publicly owned lots within the study areas. Off-street parking supply varies much more than on-street due to the variation in land uses and density in the eight study areas. Off-street parking ranges from a low of 726 spaces at Highland Park to a high of 3,774 spaces at Wilshire/Western, with a median of 1,580 off-street spaces for all eight locations.

- Transit usage varies considerably among the station areas from 10,000 average weekday riders (boarding plus alighting) at Hollywood/Vine (Red Line), over 9,000 riders at Vermont/Sunset (Red Line) and Wilshire/Western (Purple Line) down to just over 1,000 riders at Sylmar (Metrolink). The median number of riders at the eight stations is 5,440 riders per weekday.

- The parking demand model estimates a theoretical deficit of parking at four TOD case study locations (Highland Park, San Pedro, Soto and Vermont/Sunset). The other stations have a theoretical parking demand near or below the actual supply. Where there is a theoretical deficit it indicates that changing land uses over time may not have been proportionately served by the built parking supply. In areas with a theoretical surplus, this may indicate a mix of land uses that is able to share parking at various times of the day. In general, where there is a theoretical deficit of parking, transit services would be more appropriate to service the excess demand, as parking is scarce and parking costs are likely to be higher due to high demand versus supply. However, there are also many other factors such as employer's policies toward parking. For example, in the Vermont/Sunset area which has the largest theoretical parking deficit, the largest employer (Kaiser Hospital) does not charge any employees for parking. There is thus no economic incentive to take transit based on the true cost of parking in this location, even with a lack of available and convenient parking supply.

Parking Utilization Surveys

- Parking occupancy surveys have been conducted during AM, mid-day, PM and nighttime periods at all station locations. 100 percent of all on-street parking was surveyed, 100 percent of all off-street publicly owned parking was surveyed and a large sample of private off-street parking was surveyed. Certain lots including most residential lots were not surveyed due to constraints in gaining access to conduct surveys.

- 85 percent peak utilization is considered to be essentially "full" since above that level of usage, drivers must search for parking and often the remaining parking is not convenient.

- On-street results showed that three stations exceeded 85 percent peak utilization, Hollywood/Vine, Vermont/Sunset and Wilshire Western. Hollywood/Vine had nearly 100 percent utilization at night, and close to 80 percent utilization during the mid-day and PM periods. Wilshire/Western had a parking usage of nearly 100 percent at night and over 70 percent mid-day and PM. Vermont/Sunset had over 85 percent usage during the AM and mid-day time periods and less demand at night.

Off-street parking was surveyed at seven station locations. The results showed that the Vermont/Sunset, Hollywood/Vine, Sylmar and Wilshire/Western stations experienced private off-street usage exceeding 70 percent, with up to 95 percent utilized at Vermont/Sunset, 78 percent utilized at Hollywood/Vine, 74 percent utilized at Sylmar and 71 percent utilized at Wilshire/Western. Sylmar off street parking includes the public Metrolink lot and it was relatively constant AM and mid-day, but declined into the PM as workers returned and took their cars home for the evening. The remaining lots with observed off-street parking had lower utilization rates below 61 percent and down to a low of 23 percent at the Laurel Canyon station.

Parking and Transit Usage Comparison for the Eight Case Study areas

A measurement of "activity" or "density" for each study area is the combined total of persons who live in the area plus the number of people employed in the area. The third measure of activity would be the number of persons visiting the area (persons who neither live nor work there); however, that number is not available as it fluctuates day to day. Thus, to measure the activity occurring in each area, the combination of population and employment gives a general indication of what type of demand there might be for both parking as well as transit services. People who reside in the area desire parking at or near their residences, and some residents will also utilize available transit services, bike or walk. People who work in the area will desire parking at or near their place of employment, or will need to use transit, bike, or walk for their commute if they do not drive to work.

To understand the relationship between transit, parking and study area activity, a measurement of parking and transit based on the measure of activity in each study area has been developed. That measurement compares **Population + Employment** against both **Parking Spaces** and against **Rail Transit Ridership**. Table 2 displays this measurement and comparison. As shown, the highest parking density per unit of measurement (Unit = Population + Employment) at Vermont/Sunset and Wilshire/Western study areas, with 1.4 and 1.2 parking spaces per unit of population + employment, respectively. The next highest is Hollywood/Vine with a parking density approaching 1.0. The rest fall well below 1.0 space per unit.

In terms of transit demand, again Vermont/Sunset and Wilshire/Western have very high transit service demand per unit, with 3.7 and 2.7 trips per unit. Other areas with high transit demand per unit include Hollywood/Vine and San Pedro. In the case of Hollywood/Vine, the added transit demand is likely not directly related to the population and employment measures; it is related to the large visitor/tourist population that comes to this area.

Policies oriented towards increasing the relative use of transit and reducing the use of single occupant automobiles would encourage more successful TOD in the City of Los Angeles. This would in turn also reduce the required peak parking supply in and near the TOD. The analysis indicates that the two areas with high parking density also have relatively high transit service demand. Various conclusions could be drawn from this analysis. On the one hand, the areas with higher Transit Demand could be viewed as the relatively more successful TOD areas. However, since the areas with higher Transit Demand also tend to have higher Parking Density it could be surmised that policies that help to further encourage transit via reducing single occupant vehicle usage (parking fees, parking maximums, shared parking, transportation demand management) could even further increase the success of transit in these TOD locations. Areas with lower transit demand and lower transit services/capacity may benefit less from parking policies oriented to reducing single occupant automobile trips.

Table 2: Parking Density and Transit Demand

Study Area	Population + Employment	Parking Spaces	Rail Ridership	Parking Density (Spaces/Pop+Emp)	Transit Demand (Ridership/Pop+Emp)
Highland Park	3,555	1,170	3,860	**0.3**	**1.1**
Hollywood/Vine	3,098	2,673	10,816	**0.9**	**3.5**
Laurel Canyon	2,451	1,286	2,460	**0.5**	**1.0**
San Pedro	1,564	1,093	4,175	**0.7**	**2.7**
Soto	3,785	1,088	2,392	**0.3**	**0.6**
Sylmar	1,860	986	1,081	**0.5**	**0.6**
Vermont/Sunset	2,597	3,643	9,534	**1.4**	**3.7**
Wilshire/Western	3,380	3,918	9,244	**1.2**	**2.7**

Table 3 assesses the relationship of transit usage as compared to parking availability. The areas of Hollywood/Vine and San Pedro do the best at capturing trips on transit as compared to the amount of parking. The ratio of rail trips to parking in those two areas is very high, indicating that more trips are occurring on transit and not as a result of people driving and parking. The next three areas with the highest ratio are Highland Park, Vermont/Sunset and Wilshire/Western. Note, however, that the number of rail transit trips per unit is still much smaller at Vermont/Sunset and Wilshire/Western as compared to Hollywood/Vine and San Pedro, indicating that there may be room to capture more trips on transit as compared to driving in those areas.

The data indicates that Hollywood/Vine is the most successful area in terms of transit usage as compared to parking availability. Interestingly, it is also the area with the highest fee structure for parking with $2/hour in meters and higher flat rates in private lots of $10 to $15. This is twice as high for on street parking as compared to other areas and significantly higher off-street fees as compared to other areas including Vermont/Sunset and Wilshire Western. Data in this report indicate that the parking fees in the Vermont/Sunset area are lower than market for both employees and visitors due to the policies of the hospitals in that area. While this is a business decision by the hospital operators, there may be opportunity to develop alternative fee structures and incentives that would help shift trips to transit in Vermont/Sunset and increase the ratio of trips/parking. Similarly, in Wilshire/Western there are several lots that provide free parking that could be reviewed. While these are private lots, shared parking agreements could be investigated that might include imposing fees for certain users. On-street peak-time variable pricing in these areas could also be reviewed in the vicinity of the transit stations to attempt to limit the use of on-street parking to only short term visitors who otherwise would not ride transit.

Table 3: Ratio of Rail Transit Usage to Parking Available

Study Area	Rail Ridership	Parking Spaces	Rail Transit Use/ Parking Spaces Available
Highland Park	3,860	1,170	3.3
Hollywood/Vine	10,816	2,673	4.0
Lauren Canyon	2,460	1,286	1.9
San Pedro	4,175	1,093	3.8
Soto	2,392	1,088	2.2
Sylmar	1,081	986	1.1
Vermont/Sunset	9,534	3,643	2.6
Wilshire/Western	9,244	3,918	2.4

Chapter 3 - Research on TOD Best Practices for Parking

This section of the report presents the results of a best practices survey and research including TOD Parking Case Studies. A summary of research and best practices, including standards, incentives/disincentives and case studies of several parking studies in Transit Oriented Districts (TODs) across the nation, is included.

Table 4 summarizes the key issues related to Transit Oriented Development areas that were uncovered by the research. The table presents a summary of key findings by issue area. The remainder of the section provides the details of the research and case studies.

Table 4: Summary of TOD Research

TOD Topic Area	Key Research Results and Findings
Residential Land Uses and TOD	• TOD households tend to be smaller and own fewer vehicles. • TOD residents have higher rates of transit use for commuting; they actively choose to live near transit access to job sites. • TOD residents use transit more for commuting than non-commuting trips. • There is demonstrated potential for reduced parking in TODs, though parking needs must be determined on site-by-site basis. • Trip generation rates tend to be lower for TOD households. • Reduced parking is found less often in high-income TODs, whereas lower-income and lower cost rental-housing TODs are found to have lower parking ratios. • There is evidence that residential parking supply exceeds demand in many TODs. • Parking supply, project land area, walking distance to transit, and peak headway of nearby transit service are important determinants of TOD parking demand among residents, hence the need for site-specific analyses.
Office Land Uses and TOD	• The growth of "hotelling," a practice in which employees report to a "home" office every day and get sent out to field locations, may be generating greater parking demand at offices. • Rising rent can cause firms to economize on office space, creating greater parking demand per square foot. • TOD office buildings use a variety of parking arrangements, including "unbundling" parking from leases. • Employees are more likely to commute by transit if they are forced to pay for parking at work.

Table 4 cont.

Parking Pricing Strategies around TOD	• Setting a price on parking can reduce vehicle ownership and stimulate mode shift. • The typical parking operator must earn \$5-\$15 daily per space to break even. • Some transit agencies with station-specific parking in TODs may bear the cost of foregone revenue from potential joint development projects at parking facility locations. • Several innovative parking pricing strategies can help further TOD goals, including "parking cash out" (employees can trade their parking spaces for cash), demand-responsive pricing, and elimination of discounts for long-term parking. • The practice of "bundling" parking spaces into leases can distort incentives in favor of driving. • There is evidence that TOD parking practices among developers are beginning to shift in favor of reduced supply and transit-friendliness.
Behavioral Responses to Parking Pricing	• The elasticity of vehicle trips with respect to parking price is between -0.1 and -0.3, i.e. a 10 percent increase in parking price corresponds to a one to three percent reduction in vehicle trips. • There is evidence that higher parking prices can encourage travelers to use transit instead of driving, especially if transit quality is high.
Benefits of Parking Reduction	• Reduction in construction costs associated with TODs, making housing more affordable • Local traffic congestion mitigation • Encouragement of transit use • Reduction in urban water runoff
Land use and Travel Behavior in TODs	• Residential and employment density tend to encourage transit use and reduce automobile use and ownership. • A mix of land uses is also critical, so that a variety of traveler needs can be met in single transit trip without reliance on an automobile. • The amount of achievable trip reduction for mixed-use developments depends on the density of the development, access to transit, and transit mode (details are provided in the report).
Methodological Challenges for TOD Parking Policymaking	• Challenges include understanding the parking environment, relating parking capacity to transit service and usage, understanding the effects of parking availability and costs, and studying the pedestrian environment.

Table 4 cont.

TOD Parking Policy Implementation	• Caltrans guidance recommends the following general steps for TOD parking reduction policy implementation: • Feasibility study • Community outreach • Action Plan • Program Monitoring
Topics Covered in TOD Parking Case Studies (14 reviewed in this report)	• Parking demand by land use • Amounts of parking reduction achievable • Negotiating reduced parking requirements during permitting process • Shared parking • Parking reduction in redevelopment areas • Urban design principles related to parking reduction in TODs

While there has been much research on the subject of TODs, there has been relatively little work dealing specifically with the issue of parking utilization in TODs. Much of the TOD research has focused on land use issues, income, types of households, mix of land uses, trip generation and related topics but not specifically parking demand. This chapter includes the most relevant research on TODs and parking, as well as other TOD-related issues such as trip generation, parking pricing, and case study results.

The first part of this section describes the research and best practices regarding parking in TODs, which can be divided into five general topics:

- Demographics and Transportation Behavior in TODs
- Parking Pricing
- Benefits of Parking Reduction
- Methodological Challenges for TOD Parking Policymaking
- Policy Implementation

A table summarizing the source documents and the key findings from research and case studies covering a broader scope of topics related to TOD characteristics can be found in the Appendix to this report.

Research and Best Practices

The following section of the report includes a summary of research and best practices for TODs. This section is followed by the summary of the 14 case studies reviewed for this effort.

Research on demographics and transportation behavior within TODs provides insight into the types of parking policy reforms that may be suitable for these areas, including residential and office oriented TOD locations.

<u>Residential</u>

"Dr. Robert Cervero at U.C. Berkeley has conducted extensive research on residents of California TODs and their travel behavior. To identify potential consumers of new TODs in California, Cervero (1996) studied over 6,500 housing units in 26 large housing projects built within one-quarter mile of urban rail stations between 1985 and 1994. Most of these projects were multi-family buildings with densities of 20 to 60 units per acre. Among Cervero's primary findings are:

- Most TOD residents are young professionals, singles, retirees, childless households, and immigrants from foreign countries.
- These groups tend to require less housing space than traditional 'nuclear families,' and are more likely to live in attached housing units for financial and convenience reasons, regardless of where the units are located.
- Most TOD residents tend to work downtown and in other locations that are well served by transit.

"In more detailed analysis of 12 housing projects near BART stations, Cervero found that TODs had an average of 1.66 people and 1.26 vehicles per household, compared to 2.4 people and 1.64 vehicles for all households located in the same census tracts. Whereas only 48% of all households in the census tracts had fewer than two vehicles, 70% of TOD households had fewer than two vehicles. Thus TODs offer the potential to reduce parking per household by virtue of attracting different types of land uses mix. While Cervero does not statistically test the direction of causality (i.e., do TODs cause people to own fewer cars, or are people with fewer cars attracted to TODs?), he cites other studies of rail access to conclude that residents are actively choosing to live in TOD locations that offer transit accessibility to job sites."[1]

The research and "the design and location of TODs enables a reduction in the number of parking spaces needed."[2]

"The research summarized in this special report [by Cervero] indicates that TODs can potentially reduce parking per household by approximately 20%, compared to non transit-oriented land uses. A wide range of parking reductions (from 12% to 60%) has also been found for commercial parking in TODs."[3]

Furthermore, research has shown that vehicle ownership for residents in smart growth areas (TODs) is lower than other areas. This also suggests that parking demand in smart growth areas should also be lower than elsewhere and that parking supplies should reflect this fact.

"To date, however, there are no clear conclusions regarding how much parking may reasonably be reduced for any particular TOD. Therefore parking needs must be calculated on a site-by-site basis."[4]
The following Table 5 is based on the findings of the Cervero's study.

[1] California Department of Transportation, 2002; p. 4.

[2] California Department of Transportation, 2002; p. 1.

[3] California Department of Transportation, 2002; p. 2.

[4] California Department of Transportation, 2002; p. 2.

Table 5: Commercial Parking Reductions at Selected TODs

TOD	Land Use	Parking Reduction
Pacific Court (Long Beach, CA)	Retail	**60%**
Uptown District (San Diego, CA)	Commercial	**12%**
Rio Vista West (San Diego, CA)	Retail/Commercial	**15%**
Pleasant Hill (CA)	Office	**34%**
Pleasant Hill (CA)	Retail	**20%**
Dadeland South (Miami, FLA)	Office	**38%**
City of Arlington (VA)	Office	**48%-57%**
Lindbergh City Center (Atlanta, GA)	Speculative Office	**19%**
Lindbergh City Center (Atlanta, GA)	Retail	**26%**
Portland (OR) Suburbs*	General Office	**17%**
Portland (OR) Suburbs*	Retail/Commercial	**18%**

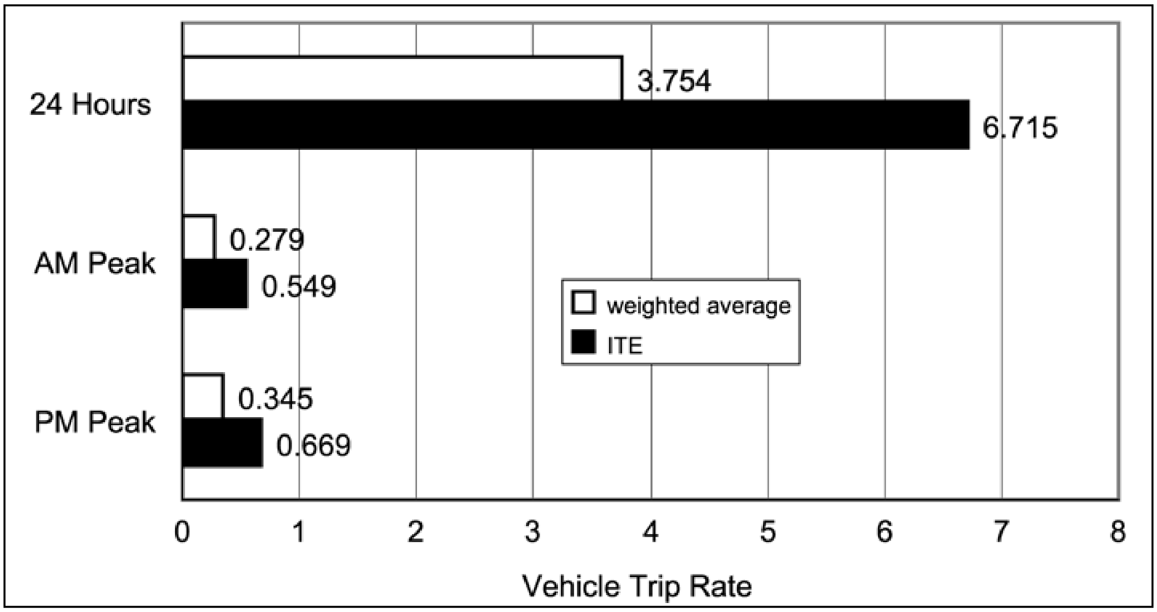
Source: California Department of Transportation, 2002; p. 8.

In a survey of 300 residents throughout four TODs in the Portland, Oregon area, Dill (2008) found that residents commuted by transit at significantly higher rates than in surrounding cities, though they did not tend to be transit dependent – most surveyed households had about one car per person of driving age, and 76 percent indicated that moving to the TOD had no impact on the number of vehicles in their household. As in Cervero's study, households in Portland's TODs were generally smaller than in surrounding areas. Respondents who were offered free parking at work were found to be less likely to commute by transit. Distance from home to transit did not have a significant effect on transit commuting rates, though distance from transit to work was found to be an important factor. Residents reported using transit less often for non-commute trips than for commute trips.

Cervero and Arrington (2008) measure vehicle trip generation rates (vehicle trips generated per dwelling unit) at 17 multi-family residential projects in TODs in four US metropolitan areas. Rates at these developments were found to be 44 percent lower, on average, than the estimate from the Institute of Transportation Engineers, which is typically used as the planning standard for TODs and non-TODs alike (see **Figure 4**). This suggests that TODs cause significant "trip de-generation" effects; that is, developments in TODs generate fewer vehicle trips than similar developments outside of TODs, due to availability of transit and other TOD characteristics.[5] The study also found that during the morning peak hour, high neighborhood densities and reduced parking supply surrounding a given project were found to have a downward influence on that site's vehicle trip generation rate.

[5] Cervero and Arrington, 2008; p. 2.

Figure 4: Comparison of Weighted Average Vehicle Trip Rates: TOD Housing and ITE Estimates



Source: Cervero and Arrington, 2010; p. 10. The "weighted averages" are the rates recorded in the TOD projects.

A 2002 Caltrans report concludes that "TOD projects that primarily include higher income groups and/or owner-occupied multi-family dwellings may not be able to reduce parking as much as TODs that incorporate numbers of lower-income households and/or rental units."[6] This is based on evidence that the correlation between income and automobile ownership persists even in areas that are well-served by transit. The report also notes that multifamily rental units with smaller households might be more suitable for parking reductions than single-family units with larger households.

Among 15 residential TOD buildings in California, Lund et al. (2004) found that while there was a very strong correlation (.98) between transit mode share (percentage of trips taken by transit, among residents) and the percentage of households with less than one vehicle per driver, there is no statistically significant correlation between parking supply (spaces per unit) and journey-to-work transit share.[7] This result suggests that residential parking supply is exceeding demand in these TODs.

Supporting this conclusion is a parking utilization study of 31 multi-family residential complexes within suburban TODs in the San Francisco Bay Area and Portland, Oregon (Cervero at al., 2010). The study found that peak parking demand was 25-30 percent below supply at these complexes. Multiple regression analysis revealed that the most important factors explaining parking demand are parking supply, project land area, walking distance to transit, and peak headway of nearby transit service.

[6] California Department of Transportation, 2002; p. 6.

[7] Willson, 2005.

Cervero et al. (2010) also conducted a survey of 80 US cities and found that 75 percent have minimum parking requirements that exceed suburban design standards, and 39 percent grant variances for residential developments near rail stops.

Office

The Caltrans study discusses two trends affecting parking utilization by office building tenants. First is the increasing practice of "hotelling," in which employees report to a "home" office every day and are then sent out to field locations during the day. Under this arrangement, employees reporting to a "home" office in a TOD may still require parking if they are sent out to a field location that is not easily accessible by transit.

The second trend affecting parking utilization by office building tenants is rising office rent, which causes firms to economize on office space by increasing their ratio of employees per square foot.

Among 10 TOD office building studied by Lund et al. (2004), there was a variety of parking payment arrangements.[8] Some employees paid for parking while others parked for free; some employers received bundled parking through their leases while others did not. There was no statistically significant correlation between parking supply (spaces per worker) and transit mode share. A positive correlation of 0.73 was found between the market price of parking and transit share, and a negative correlation of 0.80 was found between the percentage of workers who park free and transit share. This suggests that workers who commute to jobs in TODs are more likely to use transit if they are forced to pay for parking at work. Willson (2005) therefore argues that "free parking undermines [the] transit access advantages that TODs provide."[9]

Parking Pricing

Setting a price on parking can reduce vehicle ownership and stimulate mode shift, two key objectives in TOD planning.[10] According to a 2010 industry survey covering a variety of types of parking, first-hour parking in the Los Angeles Central Business District ranged from $4.63 to $15.08, and daily maximums ranged from $10.25 to $29.13.[11]

Litman (2011) argues that the most efficient outcome is produced when parking prices are set to match the cost of constructing, operating, and maintaining the facility. **Figure 5** summarizes these costs and shows how they vary depending on the type of parking facility. Based on these costs, Litman (2011) estimates that the typical parking facility operator must earn between $5 and $15 in daily revenue per

[8] Willson, 2005.

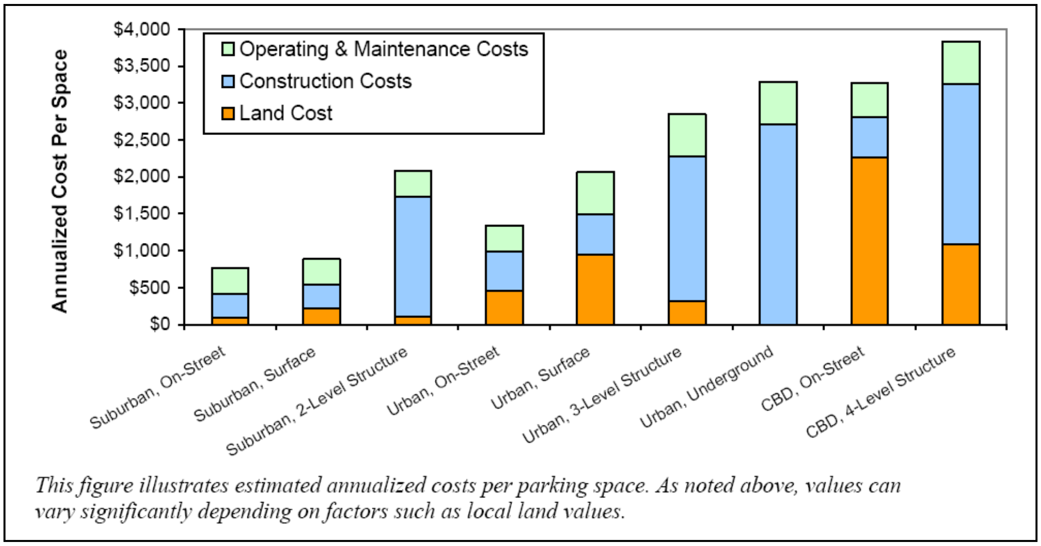
[9] Willson, 2005; p. 85.

[10] Litman, 2011.

[11] National Parking Association, 2010.

space in order to break even. Note that for certain facility types, cost can be highly sensitive to land value.

Figure 5: Typical Parking Annualized Costs per Space (2007 USD)



Source: Litman, 2009.

Willson and Menotti (2007) argue that transit agencies owning station-specific parking in TODs may experience an additional cost in the form of foregone revenue from potential joint development projects at the parking facility locations. The study uses a quantitative model to assess the potential benefits of adopting relaxed parking replacement requirements for joint development projects on agency-owned land. Using two BART stations as case studies, the authors conclude that "creative access and replacement parking arrangements can make joint development feasible and unlock a reliable, unrestricted cash flow [and] leaving transit agencies' land resources in surface parking involves a substantial opportunity cost in some station contexts."[12] However, the study suggests that this may not be the case for stations in lower-density suburban settings where land value is lower and accessibility to transit via alternative modes is more limited.

Pricing Strategies

In addition to standard metered street parking, residential parking permits, and commercial parking lot fees, there are several alternative methods of parking pricing that have gained favor among many parking experts. For example, "parking cash out" is a practice where employees are provided the option of trading their parking space at work for its cash value, effectively placing a price on retaining the space. Some have also recommended the elimination of discounts for long-term parking, in order to discourage commuter parking relative to shopper or other non-commuter parking.[13]

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[12] Willson and Menotti, p. 123.

[13] Vaca and Kuzmayak, 2005; p. 13-2.

Under another strategy, known as "unbundling," landlords offer tenants parking spaces as independent items that can be leased separately from the main property itself. The prevailing standard practice of "bundling" parking into leases means tenants do not face a price for their parking spaces – even though landlords may be passing the cost along to them through higher rent – and they are incentivized to adopt transportation habits that assume the parking is truly "free." Willson (2005) notes that this practice can be "particularly problematic"[14] for TODs, where transit investment is the greatest. The lack of prices for residential spaces also makes it difficult for researchers to estimate the true demand for this portion of the parking market.

None of the residential projects in the TODs surveyed by Lund et al. (2004) offered parking as a separate item from the residential unit itself. However, based on interviews with 11 TOD developers in Pasadena in summer 2004, Lund and Willson (2005) find that parking practices are slowly beginning to change. Some developers are building fewer spaces per unit, and some are unbundling spaces and offering them for rental at market price. Developers expressed the need for more examples of successful experiences with this type of parking practice in order to build confidence in their market viability and encourage more widespread implementation.[15]

An additional innovative strategy is demand-responsive pricing, where prices can be adjusted automatically in order to maintain a desired occupancy rate. San Francisco currently employs this method on a limited scale for both on-street and off-street parking through its SF*park* project.[16] Los Angeles also recently launched a one-year pilot program called Express Park that uses technology and demand-based pricing as a parking management strategy.[17]

In the case of street parking, parking revenue can be used to fund street and community improvements. Keeping the revenue local in this way can make the parking pricing more acceptable to parkers and surrounding property owners, provided the policy is properly communicated. This strategy was successfully implemented in Downtown Pasadena in the 1990s.[18]

<u>Behavioral Responses</u>

Research suggests that the elasticity of vehicle trips with respect to parking price is between -0.1 and -0.3, i.e. a 10 percent increase in parking price corresponds to a one to three percent reduction in vehicle trips. Variation within this range depends on "demographic, geographic, travel choice and trip

[14] Willson, 2005; p. 83.

[15] Willson, 2005.

[16] SFMTA, 2012.

[17] LADOT, 2012.

[18] Kolozsvari and Shoup, 2003.

characteristics."[19] For instance, Kuppam et al. (1998) find evidence that mode shifting in response to parking prices is more likely in areas with low-income residents, sidewalks, and transit availability.

It is important to note, however, that the elasticities reported in the research may not be due entirely attributable to mode shift or trip reduction – depending on local characteristics and study design, some degree of elasticity may simply reflect drivers using other nearby lots as substitutes or parking at higher-priced spaces for shorter durations.[20]

Frank et al. (2011) look directly at the effect on driving and find that based on travel survey data, an increase in parking fees from approximately $0.28 to $1.19 per hour would reduce VMT by 11.5 percent. Similarly, Hess (2001) uses travel diary data to develop a mode choice model that predicts that the imposition of a $6 parking fee in downtown Portland, Oregon would result in 21 fewer automobiles driven per 100 commuters, compared to a free parking scenario.

There is also evidence that increased parking fees can cause some travelers to use transit instead of driving.[21] The TRACE research program (1999) estimates an elasticity of 0.02 for transit trips with respect to parking price. In a study of downtown Los Angeles, Shoup (1990) finds that transit use is greater among commuters who do not receive free parking, and higher market prices for parking in the area of employment are associated with greater transit use among these commuters (but not among those who do receive free parking). In another study, parking cash-out programs implemented by eight Southern California employers prompted an increase in transit mode share from 5.8 percent to 8.3 percent among employees and a decrease in drive-alone mode share from 76.8 percent to 65.3 percent.[22]

The quality (as opposed to mere existence) of transit service also appears to be a major factor in determining the degree of potential mode shift in a particular area. According to a Transportation Research Board report, model estimates indicate that whereas 36 percent of drive-alone commuters would switch to transit in response to parking charges in an area with high-quality transit service, only a 10 percent switch could be achieved in an area with poor-quality service.[23]

<u>Benefits of Parking Reduction</u>

Successful parking reduction measures can produce a wide variety of benefits. For example, "reduced parking requirements can lower TOD construction costs, which in turn can make housing more affordable and/or allow more development to be built on sites near transit. For example, in one case

[19] Litman, 2011; p. 19.

[20] Vaca and Kuzmyak, 2005.

[21] Vaca and Kuzmyak, 2005.

[22] Vaca and Kuzmayak, 2005; derived from Shoup, 1997.

[23] Vaca and Kuzmyak, 2005.

study of six San Francisco neighborhoods, the standard requirement for off-street parking was found to increase costs for single family homes and condominiums by more than ten percent.

"In addition, reduced parking requirements can:

- Reduce residential parking rates
- Reduce office/commercial rents
- Lessen urban water runoff
- Reinforce/encourage transit use
- Increase taxable square footage
- Improve local traffic circulation
- Improve urban design, and
- Generate congestion management credits for businesses (where applicable)"[24]

Land Use and Travel Behavior at TODs

The TOD research literature contains robust evidence that residential and employment density has a strong tendency to encourage transit use while reducing automobile use and ownership. Density is therefore a crucial component of effective TOD planning, and according to Caltrans, it is "a key component in the efficient provision of transit."[25]

In addition to density, the literature suggests that it is important for TOD planners to ensure a mix of land uses so that a variety of trip purposes, or "errands," can be can be conveniently satisfied during a single trip, without relying on the use of an automobile.

A study in Portland, Oregon estimates the reduction in vehicle trips that can be achieved by mixed-use developments. The study shows that the amount of trip reduction achieved depends on the density of the development, access to transit, and transit mode:

Mixed-Use (commercial, restaurants, and light industrial) with 30 percent or more of its floor space dedicated to residential:

With a minimum FAR of 0.5, vehicle trips are expected to be reduced by approximately 1.9%.
With a minimum FAR of 1.0, vehicle trips are expected to be reduced by approximately 3.0%.
With a minimum FAR of 1.5, vehicle trips are expected to be reduced by approximately 4.2%.
With a minimum FAR of 2.0, vehicle trips are expected to be reduced by approximately 7.0%.

[24] California Department of Transportation, 2002; p. 1-2.

[25] California Department of Transportation, 2002; p. 48.

Mixed-Use (commercial, restaurants, and light industrial) with 30 percent or more of its floor space dedicated to residential within ¼ mile of a bus corridor:

With a minimum FAR of 0.5, vehicle trips are expected to be reduced by approximately 2.7%.
With a minimum FAR of 1.0, vehicle trips are expected to be reduced by approximately 4.3%.
With a minimum FAR of 1.5, vehicle trips are expected to be reduced by approximately 6.0%.
With a minimum FAR of 2.0, vehicle trips are expected to be reduced by approximately 10.0%.

Mixed-Use (commercial, restaurants, and light industrial) with 30 percent or more of its floor space dedicated to residential within ¼ mile of a light rail station:

With a minimum FAR of 0.5, vehicle trips are expected to be reduced by approximately 3.9%.
With a minimum FAR of 1.0, vehicle trips are expected to be reduced by approximately 6.7%.
With a minimum FAR of 1.5, vehicle trips are expected to be reduced by approximately 11.9%.
With a minimum FAR of 2.0, vehicle trips are expected to be reduced by approximately 20.0%.

The study reveals similar results for commercial developments:

Commercial development within ¼ mile of a bus corridor:

With no minimum FAR, vehicle trips are expected to be reduced by approximately 1.0%.
With a minimum FAR of 0.5, vehicle trips are expected to be reduced by approximately 1.9%.
With a minimum FAR of 1.0, vehicle trips are expected to be reduced by approximately 3.0%.
With a minimum FAR of 1.5, vehicle trips are expected to be reduced by approximately 4.2%.
With a minimum FAR of 2.0, vehicle trips are expected to be reduced by approximately 7.0%.

Commercial development within ¼ mile of a light rail station:

With no minimum FAR, vehicle trips are expected to be reduced by approximately 2.0%.
With a minimum FAR of 0.5, vehicle trips are expected to be reduced by approximately 2.9%.
With a minimum FAR of 1.0, vehicle trips are expected to be reduced by approximately 5.0%.
With a minimum FAR of 1.5, vehicle trips are expected to be reduced by approximately 8.9%.
With a minimum FAR of 2.0, vehicle trips are expected to be reduced by approximately 15.0%.

Methodological Challenges for TOD Parking Policymaking

TOD parking reduction policies and strategies must be tailored to the unique regional and site-level characteristics in each district where they are to be implemented. The following are among the factors that must be considered when crafting an approach to parking reduction:

- Understanding parking environment around TOD locations
- Relating parking capacity to transit usage and type of transit service
- Understanding the effects of parking costs

- Understanding the effects of parking availability
- Cover various station "area types" (urban, suburban, mixed-use)

Another factor that might be useful in studying parking utilizations in TODs is studying walk access and the pedestrian environment. People generally prefer to walk to the transit station if they feel safe to walk or bike to the station. This is also another critical factor to study whilst conducting parking studies.

The present study is the first of its kind to be carried out for TODs in Los Angeles. Therefore, no existing case study provides results or lessons that can be applied directly to the sites examined in the present study without first considering the case-specific factors discussed above.

Policy Implementation

Although there is a considerable variety of approaches to parking reduction, Caltrans has laid out a "simplified, 'generic' process"[26] that provides agencies with generalized guidance on the implementation of TOD parking reduction policy.

The process, as prescribed by Caltrans, includes the following essential steps:

- Feasibility Study: This study should include an analysis of existing parking conditions, and it should select a specific set of parking reduction strategies to be considered for implementation. Information on existing conditions may be collected through a parking utilization study or through a survey of residents and/or employees.
- Community Outreach: Planners must actively engage and seek out the participation of key stakeholders in the community. This allows planners to educate the community on the proposals and articulate the policy rationales, and it allows the community to identify concerns and potential stumbling blocks.
- Action Plan: The policies or agreements stated in the Action Plan should be developed openly and collaboratively, and the Plan should address the concerns raised by participants and stakeholders. Some stakeholders may have competing interests, and these conflicts should be resolved through a process of negotiation.
- Program Monitoring: As the program is implemented, it should be subject to "periodic reviews and adjustments," in consultation with stakeholders. In addition, the results of the program should also be assessed at an agreed-upon time, in order to determine whether the program is meeting its goals and identify any further adjustments that must be made in order to improve outcomes.

[26] California Department of Transportation, 2002; p. 24.

Summary of Research of Best Practices

From the available research and case studies (a summary of various case studies from other areas is provided in Appendix B), it can be noted that current typical municipal parking requirements are likely higher than typical parking demand at most TOD locations. "Intrinsic smart growth development characteristics, such as higher densities, proximity to transit, mixed uses with local serving retail, and bicycle facilities, serve to reduce parking demand."[27] Therefore careful planning and studies need to done before planning for parking in these areas.

The work conducted as part of this project will add to the understanding of TOD characteristics in Los Angeles. Further technical work and policy discussion will be required to determine specific strategies related to TOD parking standards, requirements, and recommendations in the city.

[27] Lee, 2010; p. 39.

Chapter 4 - City of Los Angeles Parking Standards

This chapter presents data and information gathered on parking standards and prices, including both on-street and off-street spaces in the City of Los Angeles and in the eight project areas. The information on parking standards consist of a summary of the existing parking regulations in the City Code, as well as the specific sets of time limits and time-of-day restrictions on metered parking in the project areas where metered parking exists. Price information for off-street parking was collected from publicly visible signs, during in-field empirical reviews conducted in each.

For on-street parking and most commercial facilities, spaces were counted visually. At some commercial facilities where spaces could not be counted visually, an attendant was questioned to determine the space count; otherwise, it was necessary to make estimates. The source of the on-street parking data and its associated parking costs is a combination of field review and information provided by LADOT.

Parking Costs

Of the eight project areas, four have paid off-street parking and all off-street parking is free in the other four areas. Table 6 shows the price information for off-street parking in these areas, along with the number of spaces subject to each price.

Table 6: Pricing Information for Off-Street Parking

Project Area	Price	No. of spaces
Highland Park	$0.25 per 30 min; $2.50 max	127[28]
	Free	*599*[29]
Hollywood/Vine	$10 flat	940
	$15 flat	175
	$2.25 per 20 min; $16 max	150
	$7 leaving before 5pm; $10 leaving after 5pm	62
	$5 first 30 min; $20 flat	60
	$25 per day	55
	Free	*949*
Vermont/Sunset	0-15 min free; 16-60 min $2; over 1 hr $4; max $4	1,500
	Free	*1,991*
Wilshire/Western	$1.50 per 12 min; $15 max	780
	$1.75 per 15 min; $14 max	500
	$1 per 15 min; $10 max; $15 flat for events	425
	$2 per 20 min; $14 max	150
	$1 per 20 min + 10% tax; $7 max	109
	2 hrs free w/ library validation; $1/hr thereafter; $8 max	60
	Free	*2,320*

[28] All City-owned parking.

[29] Includes 93 City-owned spaces (83 two-hour spaces, 10 disabled).

All paid off-street parking in the Highland Park project area is contained in the area's four City-owned parking facilities, all of which are surface lots. These lots contain a total of 127 paid parking spaces, as shown in Table 6; each priced from $0.25 per 30 minutes up to a $2.50 maximum. In addition to the paid spaces, the City lots also contain 83 free 2-hour parking spaces and 10 disabled spaces.

It can be observed that whereas Highland Park and Vermont/Sunset each have only one price assigned to all paid off-street parking, Hollywood/Vine and Wilshire/Western have a variety of prices. Variation in prices within these two project areas is presumably related to location and associated land uses that the parking supports, though there may also be some correlation with the quality of the facility itself. There is no apparent relationship between pricing and number of spaces per lot structure. Hollywood/Vine is the only project area where a majority of off-street parking spaces – in fact, a majority of *all* parking spaces – are paid. The project area is also unique in that the prices are predominately structured as flat rates, generally either $10 or $15.

With only one exception for special events, all paid parking in the Wilshire/Western project area is marginal – a rate per fraction of an hour (typically 15 minute increments) – up until roughly two hours, when a maximum is reached. Prices in this area generally range from about $1 per 15 minutes up to $1.75 per 15 minutes, and maximum rates per day generally fall in the range of $7 to $15.

The 1,500 paid off-street parking spaces in the Vermont/Sunset project area are all contained in two facilities. Both facilities are Kaiser Permanente structures, and both use the same pricing scheme, as shown in Table 6, with the first 15 minutes free and a $4 maximum after one hour. Fees are charged to Kaiser visitors, but staff receive parking free of charge. These two structures provide a combined 43 percent of off-street parking capacity in the project area.

Table 7 contains the hourly prices for metered parking in the five project areas where metered parking was found, along with time limits and time-of-day restrictions. It can be observed that all metered parking costs $2 per hour in the Hollywood/Vine project area, whereas all metered parking in all other areas costs $1 per hour.[30] It can also be observed that all of the areas have a mix of one-hour and hour-hour parking, with the exception of Soto, which contains only 1-hour parking.

[30] There are, however, 14 parking spaces in the Wilshire/Western project area that offer discounted 10-hour parking for $4, as shown in the Table.

Table 7: Pricing Information for Paid On-Street Parking

Project Area	Price per hour	Times of day	Time Limit (hours)	No. of Spaces
Highland Park	$1	8A-8P Mon-Sat	1	64
	$1	8A-8P Mon-Sat	2	65
Hollywood/Vine	$2	8A-6P Mon-Sat	1	17
	$2	8A-6P Mon-Sat, 11A-6P Sun | PLO 6P-12MID	1	3
	$2	8A-8P Mon-Sat, 11A-8P Sun	2	31
	$2	8A-8P Mon-Thu, 8A-12MID Fri-Sat, 11A-8P Sun	1	83
	$2	TANP 3A-6A | PKG 8A-6P Mon-Sat, 11A-6P Sun	1	3
	$2	TANP 3A-6A | PKG 8A-8P Mon-Thu, 8A-12MID Fri-Sat, 11A-8P Sun	1	10
	$2	TANP 6A-3P Sun Only | PKG 8A-8P Mon-Sat, 3P-8P Sun | Taxi 8P-3A Daily	2	2
	$2	TANP 6A-3P Sun Only | PKG 8A-8P Mon-Thu, 8A-12MID Fri-Sat, 3P-8P Sun	1	10
	$2	TANP 6A-3P Sun Only | PKG 8A-8P Mon-Thu, 8A-12MID Fri-Sat, 3P-8P Sun	2	21
	$2	TANP 6A-3P Sun, 6P-3A Daily | PKG 8A-6P Mon-Sat, 3P-6P Sun	2	5
	$2	TANP 6A-3P Sun, 8P-3A Thu-Sat | PKG 8A-8P Mon-Sat, 3P-8P Sun	2	3
	$2	TANP 6P-3A | PKG 8A-6P Mon-Sat, 11A-6P Sun	1	8
	$2	TANP 6P-3A | PKG 8A-6P Mon-Sat, 11A-6P Sun	2	7
	$2	TANP 8P-3A Next Day Thu-Fri-Sat Nights | PKG 8A-8P Mon-Sat, 11A-8P Sun	1	5
Soto	$1	8A-8P Mon-Sat	1	33
Vermont/Sunset	$1	8A-8P Mon-Sat	1	44
	$1	8A-8P Mon-Sat	2	36
	$1	TANS 4P-7P Mon-Fri | PKG 8A-4P Mon-Fri, 8A-8P Sat	1	20
	$1	TANS 4P-7P Mon-Fri | PKG 8A-4P Mon-Fri, 8A-8P Sat	2	11
	$1	TANS 4P-7P Mon-Fri | PKG 8A-4P Mon-Fri, 8A-8P Sat	2	8
Wilshire/Western	$1	8A-6P Mon-Sat	¼	3
	$1	8A-6P Mon-Sat	1	101
	$1	8A-6P Mon-Sat	2	45
	$1	TANS 4P-7P Mon-Fri | PKG 8A-4P Mon-Sat	1	9
	$1	TANS 7A-9A Mon-Fri | PKG 9A-6P Mon-Sat	1	6
	$1	TANS 7A-9A, 4P-7P Mon-Fri | PKG 9A-4P Mon-Sat	1	33
	$1/hr-$4/10hr	8A-6P Mon-Sat	10	14

PKG: Parking Allowed
PLO: Passenger Loading Only
TANP: Tow-Away No Parking
TANS: Tow-Away No Stopping

Parking Regulations

Tables 8 and 9 summarize the parking regulations in the City Code for commercial and residential land uses, respectively. These regulations dictate the minimum amounts of parking to be required for specific categories of commercial uses and housing. Commercial requirements are typically expressed as a ratio of spaces per square foot, whereas residential requirements are given as spaces per unit.

The regulations presented in these tables may not reflect actual parking conditions in the project areas, because portions of the project areas may be located within Specific Plans, Interim Control Ordinances, or special districts, which may be subject to different sets of regulations, as noted below the tables. Moreover, even in areas that are subject to the regulations shown here, some buildings may have changed land uses over time without making corresponding adjustments to parking capacity. Finally, some of the developments in the project areas may pre-date current parking regulations.

Table 10 lists all special district overlay zones that contain any portion of one of the eight project areas. Community Redevelopment Agency (CRA) project areas are the only type of special district overlay zone that happen to do so; however the Los Angeles CRA was dissolved by state mandate in 2012. These CRA zones follow the same parking code and regulations as in the City of Los Angeles code of parking regulations.

Table 8: Summary of City of L.A. Parking Regulations – Commercial

	Use of Building (or portions of) Commercial uses	Ratio (spaces/sq. ft.)
Regular Provisions Sec. 12.21A4	1. Health or Athletic Club, Bath House, Dance Hall/Studio, Gymnasium, or similar (e.g. amusement)	1 per 100
	2. Restaurant, Café, Coffee Shop, Bar, Night Club, or similar	1 per 100
	3. Small Restaurant, Café, or Coffee Shop (1000sq. Ft. or less)	1 per 200
	4. Take-out Restaurant (no eating on the premises)	1 per 250
	5. Retail or Discount Wholesalers	1 per 250
	6. Retail Furniture, Major Appliances, or similar	1 per 500
	7. Auditoriums: Church, High School, College, Stadium, Theater, and similar assembly	1 per 35 or 1 per 5 fixed seats
	8. Elementary School, Child Care	1 per classroom or minimum 1per 500
	9. Commercial School: Trade, Music, Professional, or similar	//////////////////////////////////
	a) Classrooms and assembly areas	1 per 50 or 1 per 5 fixed seats whichever is greater
	b) Classrooms with heavy equipment	1 per 500
	10. Philanthropic Institution, Government Office, or similar	1 per 500
	11. Commercial or Business Office	1 per 500
	12. Medical Office, Clinic, or Medical Service Facility	1 per 200
	13. Hospital	2 per bed
	14. Sanitarium or Convalescent Home	1 per 500 or min 0.2 per bed
	15. Warehouse or Storage (for Household Goods) - first 10,000 sq. ft. - beyond 10,000 sq. ft.	1 per 500 (plus) 1 per 5000
	16. Other Business or Commercial (not listed above)	1 per 500
Special Provisions	17. Auto Dismantling Yard, Junk Yard or Open Storage in the M2 or M3 zones [Sec. 12.19A4 (b)(4)]	6 for the first acre, 1 per 12,000 sq. ft. for the second acre and 1 for each acre over two.

EXCEPTIONS TO COMMERCIAL REGULATIONS

*1. **Historical Buildings (ZI 145's)** - no change in parking in connection with a change of use within existing area.*
*2. **Downtown Parking District (DPD)** - the following uses need only provide parking at the following ratios in lieu of the parking required by the General Provisions of section 12.21.A4:*
(a) Auditoriums and similar places of assembly - 1 per 10 fixed seats or 1 per 100 sq. ft. of floor area if no fixed seating
(b) Hospitals, Philathropic Institutions, Government Offices or similar uses - 1 per 1000 sq. ft.
(c) Business, Commercial or Industrial - 1 per 1000 sq. ft. for buildings 7500 s. ft. or more, NO parking required if less than 7500 sq. ft.
(d) Warehouse - 1 per 1000 sq. ft. for the first 10,000 and 1 per 5,000 sq. ft. for over 10,000
*3. **Community Redevelopment Areas (CRA) not in DPD (ZI 940, ZI 1048, ZI 1084, ZI 1352)** - commercial office, business, retail, restaurant, bar and related uses, trade schools, or research and development buildings need only provide 2 parking spaces for every 1000 sq. ft. of floor area.*
*4. **Enterprise Zones not in DPD (ZI 1643, ZI 1644, ZI 1645, ZI 1652, ZI1653)** - commercial office, business, retail, restaurant, bar and related uses, trade schools, or research and development building need only provide 2 parking spaces for every 1000 sq. ft. of floor area.*

Areas located within Specific Plans, Interim Control Ordinances, or special districts may have different parking requirements.

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Table 9: Summary of City of L.A. Parking Regulations – Residential

	Use of Building (or portions of) Residential uses	Ratio (spaces/unit)
Regular Provisions Sec. 12.21A4	1. Single-Family Dwelling (SFD)	2
	2. Two-Family Dwelling or Apartment	//
	units > 3 habitable rooms (such as a typical 2 bedroom unit)	2
	units = 3 habitable rooms (such as a typical 1 bedroom unit)	1.5
	units < 3 habitable rooms (such as a typical Single unit)	1
	3. Hotel, Motel, Boarding House or Dormitory	//
	first 30 guestrooms	1
	next 30 guestrooms	½
	remaining guestrooms	1/3
	4. Condominiums	As required by City Planning

EXCEPTIONS TO RESIDENTIAL REGULATIONS

*1. **SFD in "hillside areas"** (as defined in the Zoning Code) which front on a substandard street and exceed 2400 sq. ft. of combined floor area require one additional parking space for each 1000 sq. ft. or fraction thereof for a maximum of 5 total spaces. A "substandard street" is one which does not have a minimum dedicated width of 36 ft. and a roadway of 28 ft.*

*2. Notwithstanding the above requirements, residential buildings in the **Central City Parking District (CCPD)** need only provide parking as follows:*

(a) Dwellings: 1 per dwelling unit, except where more than 6 dwelling units of more than 3 habitable rooms. Ratio for all such units of at least 1-1/4 for each dwelling of more than 3 habitable rooms.

(b) Guestrooms: 1 for first 20, 1/4 for next 20, 1/6 for remaining.

*3. **One SFD on a narrow lot (40 ft. or less)**, not abutting an alley, requires only 1 parking space. This does not apply to lots in Hillside Areas (defined in Zoning Code) in A1, A2, A, RE, RS, R1 and RD zones fronting on a substandard street.*

*4. **Affordable Housing Incentives** - Lowered parking requirements for "restricted affordable units" per Ordinance No. 170, 764.*

Areas located within Specific Plans, Interim Control Ordinances, or special districts may have different parking requirements.

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Table 10: Correlation of TOD Study Areas to Former Community Redevelopment Agency Project Areas

Stations	Community Redevelopment Agency Zone
HIGHLAND PARK	None
HOLLYWOOD/ VINE	Hollywood Redevelopment Project
LAUREL CANYON	Laurel Canyon Commercial Corridor Redevelopment Project
SAN PEDRO	Council District 9 Redevelopment Project
SOTO	Adelante Eastside Redevelopment Project
SYLMAR	Pacoima/Panorama City (CD7) Earthquake Disaster Assistance Project
VERMONT/ SUNSET	E. Hollywood/Beverly Normandie Earthquake Disaster Assistance Project
WILSHIRE/ WESTERN	Wilshire Center/Koreatown Redevelopment Agency

Chapter 5 – Parking Inventory and Characteristics at Eight Case Study Locations

This chapter presents parking inventory data collected for the eight TOD project areas. The chapter includes detailed parking inventory data in the vicinity (within one eighth of a mile) of each transit station. The data also quantifies parking by price and type of parking. Also included is a discussion of the Parking Demand Analysis model that was created to assess the theoretical parking demand in each of the eight study areas. The parking demand analysis is intended to provide insight regarding whether each area has the correct amount of parking for its land uses and density, or if it is over or under-parked. Each condition (sufficient parking, not enough parking, surplus of parking) could have implications on the use of transit in the TOD area.

Following a description of the data collection methodology, a detailed explanation of the data structure and preliminary findings are described in the chapter. Ultimately, the goal is to use this information to help inform parking and land use policies, as well as transportation demand management (TDM) strategies, in the vicinity of transit centers. Parking in particular could affect transit ridership based on two key factors:

- Parking availability
- Cost of parking

Presumably, either the inability to find convenient parking or the cost of parking (or both), could encourage the use of transit as an alternative to driving and parking near a TOD. The data presented in this report will help provide a basis for this evaluation of parking and transit within TOD areas.

Aerial photographs from Google Earth and street-level photographs from Google Maps were used to first locate where parking capacity was thought to exist within each zone, and to record the "type of parking" (on-street, surface lot, or structure/subterranean) at each of these locations.

Comprehensive in-field empirical reviews were conducted in order to verify the observations made from the aerial photographs, achieve a more precise capacity count, and collect data on pricing. The in-field reviews also allowed for the identification of certain parking facilities – most notably subterranean structures – that are difficult or impossible to discern from aerial photographs.

For street parking and most commercial facilities, spaces were counted visually. At some commercial facilities where spaces could not be counted visually, a parking attendant was questioned to determine the space count; otherwise, it was necessary to make estimates.

Some of the residential parking capacity in the project areas could neither be counted nor reliably estimated, due to closed gates or garage doors. These private "unobserved spaces" were not included in the residential parking counts (only residential spaces that are visibly open and could be readily counted were thus included). Table 11 provides approximations of the percentage of land area occupied by unobserved parking facilities in each project area. In all cases, approximately 95 percent of spaces are accounted for in the inventory, with 5 percent or less of the parking that could not be observed.

Table 11: Unobserved Parking Coverage

Project Area	% Land Area Occupied by "Unobserved" Parking
HIGHLAND PARK	5%
HOLLYWOOD/ VINE	5%
LAUREL CANYON	5%
SAN PEDRO	All spaces included
SOTO	1%
SYLMAR	5%
VERMONT/ SUNSET	All spaces included
WILSHIRE/ WESTERN	All spaces included

Parking Demand Analysis Model

The purpose of the parking demand model is to compare the existing parking supply with the estimated parking demand in the study areas. The parking model allows assessment of various study area characteristics such as:

- If the land uses have changes over time but the parking has not kept pace, this might indicate a deficit in parking.
- Economic conditions might make the parking utilization observations low, even if there is a deficit of parking. This would be due to vacancies in office and commercial buildings that currently generate lower than normal demand for parking. The parking demand model will help identify locations were the theoretical parking demand is greater even though the empirical surveys indicate lower demand. In these areas, once the economy returns to normal, more parking deficiencies would arise than were measures in the field surveys.

The parking demand model is developed using the following process.

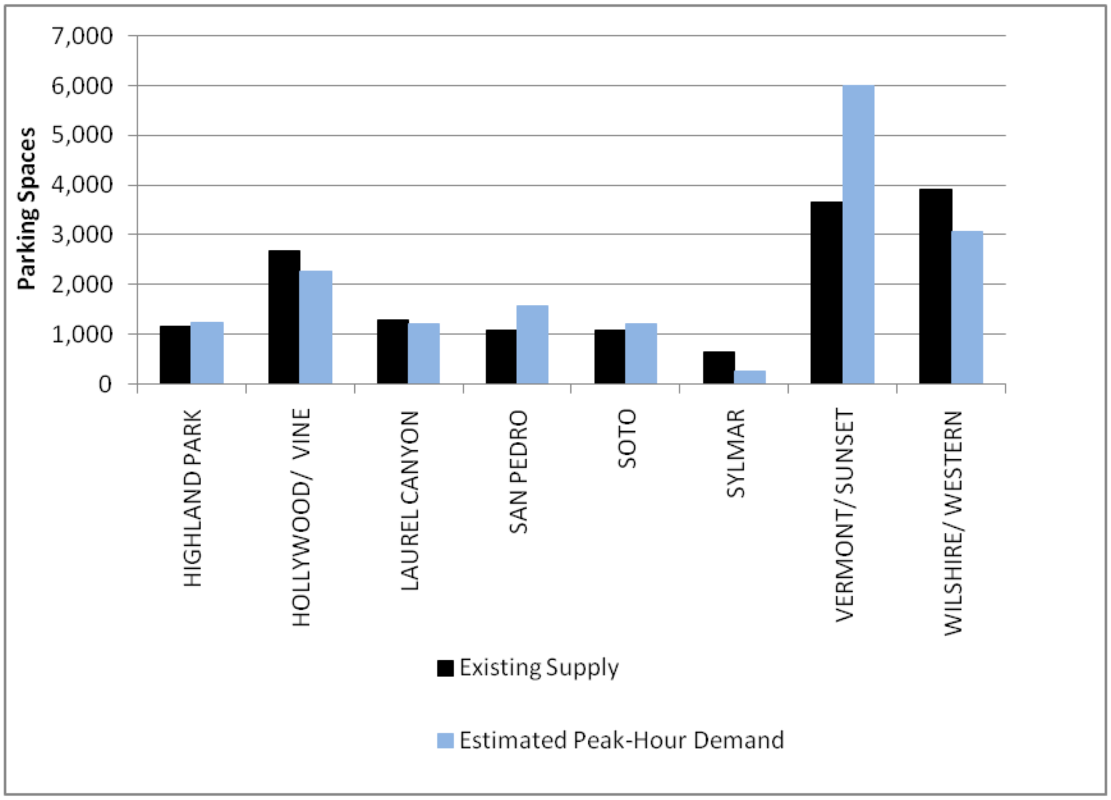
<u>1) Theoretical parking demand based on City code requirements:</u> The model first calculates theoretical parking demand, which is defined as the amount of parking required by current City code and regulations. The amount of parking required for a given parcel depends on the land use type and intensity. The model thus determines the amount of parking required for each parcel based on the parcel's land use, and then sums the parking amounts across the entire study area to arrive at the theoretical parking demand. The resulting theoretical parking demand is overestimated as compared to actual peak hour parking demand since land uses have different time of day peaking characteristics. Thus, there will be unused spaces and a surplus of spaces during the time frames when land uses have lower activity levels (for example early in the morning retail does not generate much parking demand nor does office in the evening).

2) Estimated peak hour demand accounting for shared parking: The model then estimates parking demand at each hour of the day on a typical weekday, accounting for the fact that the time pattern of parking usage throughout the day varies by land use (e.g. residential parking demand peaks at night, whereas retail typically peaks mid-day). Total parking demand at each hour of the day is summed across all land uses to determine peak-hour parking demand for the project area. These factors are derived from the latest edition of the Urban Land Institute "Shared Parking" publication. According to the model's estimates, the peak hour of parking demand occurs between the 12 PM and 2 PM in all areas with the exception of Sylmar, which peaks at 8 PM due to the residential characteristics of this area.

The estimated peak-hour parking demand obtained from the model is compared to the actual existing parking supply, as recorded during the in-field visits. These comparisons can be seen at the project-area level in **Figure 6**, and they are shown at the zone level in each project-area subsection of the report. **Figure 6** compares existing parking supply, as recorded during the in-field visits, with estimated peak-hour parking demand, as estimated by the parking demand model. The results generally indicate the following:

- Four case study areas have estimated parking demand that approximately matches the measured supply. Those areas are Highland Park, Laurel Canyon, Soto and Sylmar. In the case of Sylmar, the transit station parking was not included in the figure.
- Hollywood/Vine is shown to have an estimated parking surplus. This is due to the fact that there are a number of surface parking lots that do not have associated land uses; they are lots for the "general public" visitors. In this area, there are often special events that use the excess parking, so in reality during key time periods the excess parking is utilized. But on a typical day the extra parking may not be fully used by the land uses in the TOD.
- San Pedro is shown to have excess parking demand, likely due to age of the buildings and lack of parking that was developed over time.
- Vermont/Sunset is shown to have excess parking demand. This also matches the empirical results which show that Kaiser uses all of its parking, employs stack overflow parking techniques and leases extra parking to serve its demand. It should also be noted that the calculation of parking demand for this area is especially difficult since the hospital uses are very complex and parking requirements change and differ based on measurement of square footage versus "beds." Typically, parking is determined based on number of beds plus square footage of other space, broken down by type of use. Hospital uses are changing over time, with greater emphasis on outpatient care. This may result in changing parking demand characteristics. But in summary, based on both the parking model and the empirical surveys, this area is under parked.
- Wilshire/Western is shown to have excess parking supply. It is not clear what causes this result for Wilshire/Western. It could be the land use database is not accurate or an excess of parking was actually built over time or recent developments had higher parking requirements applied to them. It does not match the empirical findings, which indicated high on-street demand and moderate off-street demand. The parking surplus may suggest that commercial businesses may have been overbuilt and/or the type of commercial activity may have changed over time to less parking intensive commercial land uses.

Figure 6: Existing Parking Supply vs. Estimated Peak-Hour Parking Demand



In the next section, details are presented for each of the project study areas with respect to the parking supply, demand and cost structure.

Parking Study Area Summary

Table 12 displays the total number of observed parking spaces in each project area and breaks these totals out by three basic types of parking: *on-street*, *surface lot*, and *structure/subterranean*. The total number of observed parking spaces in each project area can be compared with the peak-hour demand, also shown in Table 12, as estimated by the parking demand model.

Each basic parking type in Table 11 is further divided into two sub-categories: the *on-street* category is divided into *metered* and *non-metered*, and the remaining two categories are each divided into *residential* and *commercial/non-residential*. The *residential* category includes parking spaces that are restricted to residents of the property. Residential parking was generally counted only for larger multi-family residential developments where the parking could be readily observed. Single family homes with garages and individual driveways are not included in the parking inventory, nor are very small lot multi-family units such as duplexes and small apartment buildings. The parking spaces associated with those small residential units (single family homes and small apartments) are not included because it is not feasible to accurately count the spaces. In addition, those parking spaces are clearly reserved only for the homeowners and thus are not directly relevant to this study.

The *commercial/non-residential* category includes any other off-street parking facilities, including those that are restricted to patrons of a particular business, as well as “public parking” facilities that are independent of nearby businesses (though some may have parking validation arrangements). It is important to separate the residential spaces from commercial spaces, since residential spaces are usually only available to the residents or in some cases their guests (not available for public usage). Commercial spaces may be open to general public parking, or they may be reserved for specific businesses. Note that the term “public parking” is avoided in these tables to avoid confusion, since the term is also sometimes used to refer exclusively to government-owned parking.

Table 12 also provides data related to transit service, land use, and demographics in each project area. These data were compiled from the US Census, Metro, and Metrolink. The purpose of providing these data is to begin to understand the parking supply in context with local land use patterns and also transit service to the area.

Table 12: Inventory Data for all Stations Including Ridership, Demographics and Land Use data

PROJECT AREA	HIGHLAND PARK		HOLLYWOOD/ VINE		LAUREL CANYON		SAN PEDRO		SOTO		SYLMAR		VERMONT/ SUNSET		WILSHIRE/ WESTERN	
Type of space	No. of spaces	% by type	No. of spaces	% by type	No. of spaces	% by type	No. of spaces	% by type	No. of spaces	% by type	No. of spaces	% by type	No. of spaces	% by type	No. of spaces	% by type
On-street	444	38%	282	11%	454	35%	469	43%	670	62%	175	18%	152	4%	144	4%
metered	*98*		*216*		*0*		*0*		22		*0*		*84*		*134*	
non-metered	*346*		*66*		*454*		*469*		648		*175*		*68*		*10*	
Surface lot	621	53%	1,739	65%	459	36%	624	57%	322	30%	473	48%	301	8%	1,059	27%
commercial/non-residential	*621*		*1,633*		*379*		*600*		218		*203*		*281*		*584*	
residential	*0*		*106*		*80*		*24*		104		*270*		*20*		*475*	
Structure/subterranean	105	9%	652	24%	373	29%	0	0%	96	9%	0	0%	3,190	88%	2,715	69%
commercial/non-residential	*0*		*198*		*295*		*0*		0		*0*		*3,150*		*2,400*	
residential	*105*		*454*		*78*		*0*		96		*0*		*40*		*315*	
Station specific parking	0	0%	0	0%	0	0%	0	0%	0	0%	338	34%	0	0%	0	0%
Total number of spaces	1,170		2,673		1,286		1,093		1,088		986		3,643		3,918	
Total commercial/non-residential	*621*	*53%*	*1,831*	*68%*	*674*	*53%*	*600*	*55%*	218	20%	*541*	*56%*	*3,431*	*94%*	*2,984*	*76%*
Total residential	*105*	*9%*	*560*	*21%*	*158*	*12%*	*24*	*2%*	200	18%	*270*	*27%*	*60*	*2%*	*790*	*20%*
Total on-street	*444*	*38%*	*282*	*11%*	*454*	*35%*	*469*	*43%*	670	62%	*175*	*17%*	*152*	*4%*	*144*	*4%*
Estimated Peak hour demand	1,244		2,263		1,218		1,566		1,198		253		6,002		3,053	
Parking Surplus/(Deficit)	(74)		410		68		(473)		(110)		733		(2,359)		865	
On-street Fees		Yes		Yes		No		No		Yes		No		Yes		Yes
Off-street Fees		Yes		Yes		No		No		No		No		Yes		Yes
Transit Service Information																
Transit Line Served	Gold Line		Red Line		Orange Line		Blue Line		Gold Line		Metrolink		Red Line		Purple Line	
Avg. weekday boardings + alightings		3,860		10,816		2,460		4,175		2,392		1,018		9,534		9,244
Avg. Saturday boardings + alightings		2,756		9,029		1,565		3,157		2,209		--		6,191		5,373
Avg. Sunday boardings + alightings		2,470		7,691		995		2,870		1,966		--		4,688		4,084
Frequency of service (in minutes)																
AM Peak		6		10		4		7		6		60		10		10
PM Peak		6		10		4		7		6		60		10		10
Weekend		15		14		13		14		14		100		14		14
Demographics																
Population		1,669		1,200		1,137		756		2,399		1,080		406		1,373
Employment[2]		1,886		1,898		1,314		808		1,386		780		2,191		2,007
Dwelling Units		556		850		614		155		779		364		204		976
Land Use																
Residential		50%		20%		75%		25%		65%		50%		15%		20%
Commercial		35%		70%		20%		10%		30%		25%		35%		80%
Industrial/Manufacturing		0%		5%		0%		50%		0%		5%		0%		0%
Open Space/Public Facilities		15%		5%		5%		15%		5%		20%		50%		0%

Note: Some additional residential spaces in the project area could not be observed and were not counted.

1. Station specific parking is parking specifically designated for use of the transit patrons. Only Sylmar station has such parking provided by Metrolink

2. Employment data from 2000 Census. This data is computed from census tract level to get block level data

Project Study Areas

<u>Highland Park Project Area</u>

Figure 7: Map of Highland Park Project Area

The Highland Park study area is located in northeast Los Angeles (see **Figure 7**), and it is served by the Gold Line, with six-minute frequency during peak hours and average weekday ridership of 3,860. The area houses 1,669 residents in 556 dwelling units, and it employs 1,886 workers. Residential land use accounts for half the total area, and commercial land use accounts for 35 percent. The remaining 15 percent of the land is designated as *Open Space/Public Facilities*.

A total of 1,170 parking spaces were counted within the Highland Park study area. Surface lots supply 53 percent of these spaces. The remaining capacity is provided primarily by on-street parking, which supplies 38 percent of total capacity, leaving the remaining nine percent to structures and subterranean facilities. Out of a total of 346 on-street parking spaces, 98 are metered. Table 13 shows the parking supply in the Highland Park project area. All observed surface lots are commercial/non-residential, while all observed structures/subterranean facilities are exclusively residential. Thus, just as there are nearly six times as many observed surface lot spaces as structure/subterranean spaces, there are nearly six times as many observed commercial/non-residential spaces as observed residential spaces.

Table 13: Actual Parking Supply vs. Peak-Hour Demand, Highland Park

Zone	Actual Parking Supply				Estimated Peak-Hour Demand (from model)	Surplus/ (Deficit)
	On-street	*Commercial/ Station Parking*	*Residential*	**Total**		
1	69	12	0	81	56	25
2	50	77	25	152	95	57
3	21	0	0	21	43	(22)
4	41	4	0	45	109	(64)
5	44	0	0	44	82	(38)
6	36	0	0	36	53	(17)
7	57	0	0	57	72	(15)
8	41	90	0	131	184	(53)
9	36	150	0	186	272	(56)
10	20	144	0	164	147	17
11	29	144	80	253	131	122
Total	444	621	105	**1,170**	**1,244**	**(74)**

Peak-hour parking demand was estimated at 1,244 spaces, which is very close to the parking supply in the project area.

Table 14: Off Street Parking Pricing, Highland Park

Price	No. of spaces	Percent
$0.25 per 30 min; $2.50 max	127	17%
Free	*599*	*83%*

*Excludes On-Street Parking

Priced parking represents roughly 17 percent of total off-street parking in the project area. Priced parking spaces were found only in the project area's four City parking facilities, all of which are surface lots. These lots contain a total of 127 priced parking spaces, as shown in Table 14, each priced $0.25 per 30 minutes up to a $2.50 maximum. In addition to the priced spaces, the City lots also contain 83 free two-hour parking spaces and 10 disabled spaces.

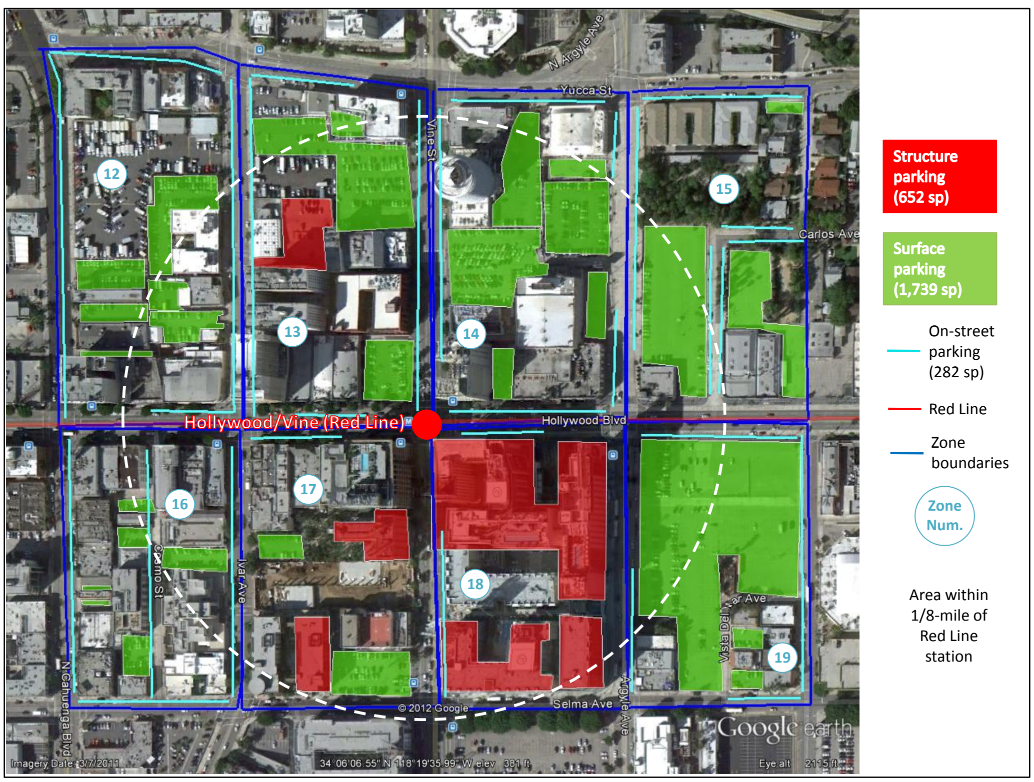
Hollywood/Vine Project Area

The Hollywood/Vine project area is located just south of the Hollywood Freeway (see **Figure 8**), and it is served by the Red Line, with 10-minute frequency during peak hours and 14-minute frequency on weekends. The area houses 1,200 residents in 850 dwelling units, and it employs 1,898 workers. Commercial land use accounts for 70 percent of the total area, making this the second-most heavily commercial project area (by land area) next to Wilshire/Western.

A total of 2,673 parking spaces were counted within the Hollywood/Vine study area. Surface lots supply 65 percent of these spaces. The remaining capacity is provided by structures and subterranean parking facilities, which supply 24 percent of total capacity, and on-street parking, which accounts for the remaining 11 percent. Out of a total of 282 on-street spaces, 216 are metered.

Commercial/non-residential parking accounts for over 90 percent of observed *surface lot* spaces. Observed *structure/subterranean* parking capacity, on the other hand, are nearly 70 percent residential.

Figure 8: Map of Hollywood/Vine Project Area



Peak-hour parking demand was estimated at 2,263 spaces, which is less than the parking supply in the project area, implying a parking surplus of 410 spaces.

More than half of the parking in the project area was found to be priced. Table 15 shows the parking supply in the Hollywood/Vine project area and Table 16 contains pricing information, along with supply counts, for the facilities that charge for parking. All except two of these facilities charge flat rates, generally either $10 or $15. The variation in prices is presumably related to location, though there may also be some correlation with the quality of the facility itself. One of the non-flat-rate facilities charges $2.25 per 20 minutes, with a $16 maximum; the other charges $5 for the first 30 minutes, with a $20 flat fee afterward. It is important to note that not all users of these facilities pay these prices – for example, some receive validation from merchants and some have monthly passes.

Table 15: Actual Parking Supply vs. Peak-Hour Demand, Hollywood/Vine

Zone	Actual Parking Supply				Estimated Peak-Hour Demand (from model)	Surplus/ (Deficit)
	On-street	*Commercial/ Station Parking*	*Residential*	**Total**		
12	36	195	0	231	211	20
13	38	295	60	393	496	(103)
14	26	335	55	416	540	(124)
15	45	180	7	232	275	(43)
16	51	101	7	159	67	92
17	51	75	135	261	359	(98)
18	13	150	284	447	197	250
19	22	500	12	534	118	416
Total	282	1,831	560	**2,673**	**2,263**	**410**

The Hollywood/Vine transit stop is the busiest of the all the project areas, with average weekday ridership of 10,816. Notably, Saturday ridership is only 17 percent lower than weekday ridership, a far smaller proportionate gap than in most of the other project areas, indicating relatively heavy weekend activity.

Table 16: Off Street Parking Pricing, Hollywood/Vine

Price	No. of spaces	Percent
$10 flat	940	39%
$15 flat	175	7%
$2.25 per 20 min; $16 max	150	6%
$7 leaving before 5pm; $10 leaving after 5pm	62	3%
$5 first 30 min; $20 flat	60	3%
$25 per day	55	2%
Free	*949*	*40%*

*Excludes On-Street Parking

Laurel Canyon Project Area

The Laurel Canyon project area is located in the Valley Village district of the San Fernando Valley (see **Figure 9**). The area houses 1,137 residents in 614 dwelling units, and it employs 1,314 workers. Residential land use accounts for 75 percent of the total area, making this the most heavily residential of the eight project areas (by land area).

Figure 9: Map of Laurel Canyon Project Area

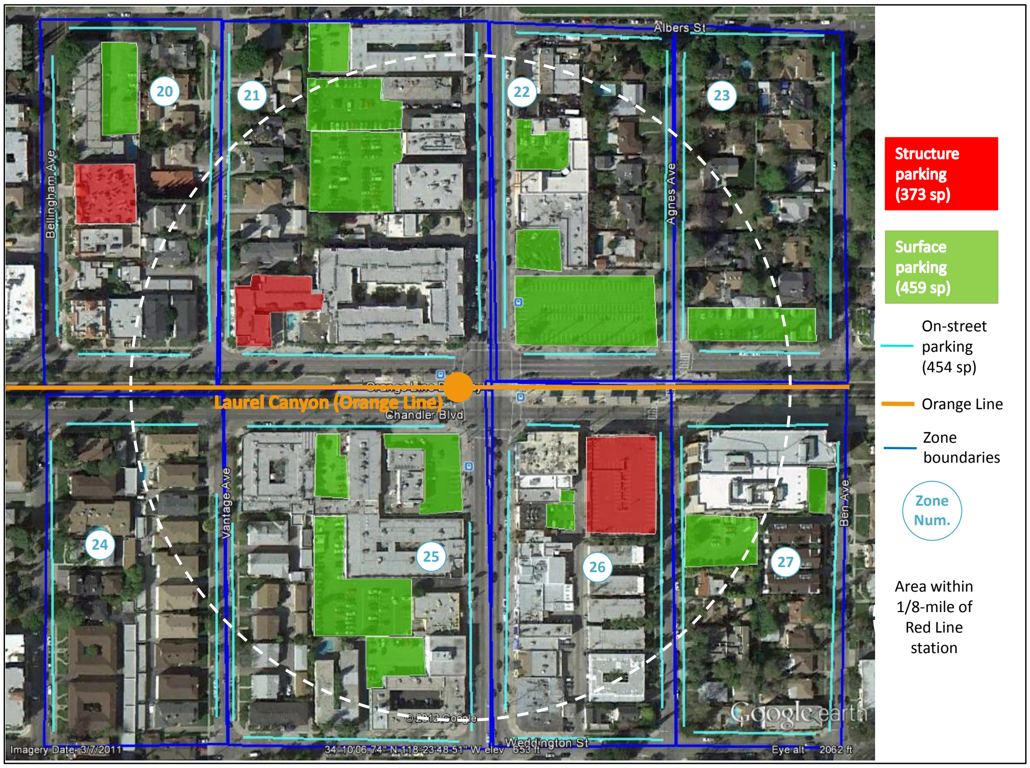


Table 17 shows the parking supply in the Laurel Canyon project area. A total of 1,286 parking spaces were counted within the Laurel Canyon study area. Compared to the other project areas, parking capacity in this area is split relatively evenly between on-street spaces, surface lots, and structures/subterranean facilities; these three parking types account for 35 percent, 36 percent, and 29 percent of parking supply, respectively. None of the on-street spaces are metered. Commercial/non-residential parking accounts for around 80 percent of observed spaces in the *surface lot* and *structure/subterranean* categories.

Peak-hour parking demand was estimated at 1,218 spaces, which very close to the parking supply.

The Laurel Canyon transit stop is served by the Orange Line, with four-minute frequency during peak hours and 13-minute frequency on weekends. This is the highest-frequency service of any of the project areas, which may be related to the fact that this is a bus-rapid-transit stop, whereas all other project areas are served by rail. Weekday ridership averages 2,460.

Table 17: Actual Parking Supply vs. Peak-Hour Demand, Laurel Canyon

Zone	Actual Parking Supply				Estimated Peak-Hour Demand (from model)	Surplus/ (Deficit)
	On-street	*Commercial/ Station Parking*	*Residential*	**Total**		
20	61	0	87	148	66	82
21	57	92	40	189	334	(145)
22	51	102	0	153	118	35
23	59	40	0	99	110	(11)
24	52	0	0	52	103	(51)
25	65	41	0	106	345	(239)
26	60	314	25	399	123	276
27	49	85	6	140	20	120
Total	454	674	158	**1,286**	**1,218**	**68**

San Pedro Project Area

Figure 10: Map of San Pedro Project Area

The San Pedro project area is located Downtown, just south of I-10 (see **Figure 10**). It is unique among the other project areas in that it is largely industrial: industrial land use accounts for half its land area, whereas it accounts for no more than 5 percent in all other project areas.

The area houses 756 residents in 155 dwelling units, giving it the highest ratio of residents to dwelling units of all the project areas, and it employs 808 workers.

The Table 18 shows the parking supply for the San Pedro project area. A total of 1,093 parking spaces were counted within the San Pedro study area. Surface lots contain 57 percent of these spaces, and non-metered on-street parking accounts for the remaining 43 percent. The area contains no structures or subterranean facilities.

Commercial/non-residential parking accounts for over 95 percent of *observed* off-street spaces. However, as previously mentioned, there may be a considerable number of unobserved residential spaces behind closed gates or garage doors, and thus there are likely more residential spaces than indicated in the results.

Peak-hour parking demand was estimated at 1,566 spaces, which exceeds parking supply in the project area and implies a parking deficit of 473 spaces.

Table 18: Actual Parking Supply vs. Peak-Hour Demand, San Pedro

Zone	Actual Parking Supply				Estimated Peak-Hour Demand (from model)	Surplus/ (Deficit)
	On-street	*Commercial/ Station Parking*	*Residential*	**Total**		
28	158	96	0	254	485	(131)
29	17	71	0	88	72	16
30	24	76	0	100	223	(123)
31	26	100	0	126	273	(147)
32	27	109	0	136	92	44
33	66	42	0	108	173	(65)
34	43	34	24	101	155	(54)
35	38	72	0	110	93	17
36	70	0	0	70	94	(16)
Total	469	600	24	**1,093**	**1,566**	**(473)**

There are no paid parking facilities in the San Pedro project area.

The San Pedro transit stop is served by the Blue Line, with seven-minute frequency during peak hours and average weekday ridership of 4,175.

<u>Soto Project Area</u>

Figure 11: Map of Soto Project Area

The Soto project area is located in Boyle Heights (see **Figure 11**), and it is served by the Gold Line, with six-minute frequency during peak hours. Residential land use accounts for 65 percent of the total area, making this the second-most heavily residential of the eight project areas (by land area), next to Laurel Canyon. Commercial land use accounts for another 30 percent of total area, and the remaining 5 percent is designated as *Open Space/Public Facilities*.

Table 19 shows the parking supply for the Soto project area. A total of 1,088 parking spaces were counted within the Soto study area. On-street parking accounts for 62 percent of these spaces. The remaining capacity is provided primarily by surface lots, which account for 30 percent of capacity, leaving the remaining 9 percent to structures and subterranean parking facilities. Out of a total of 670 on-street parking spaces, only 22 are metered.

Commercial/non-residential parking spaces account for roughly two-thirds of the capacity supplied by surface lots. However, since all structure/subterranean parking in the area is residential, total residential parking capacity ends up being about equal to total commercial/non-residential capacity, each category representing around 20 percent of total parking supply.

Peak-hour parking demand was estimated at 1,198 spaces, which exceeds parking supply in the project area and implies a parking deficit of 110 spaces.

Table 19: Actual Parking Supply vs. Peak-Hour Demand, Soto

Zone	Actual Parking Supply				Estimated Peak-Hour Demand (from model)	Surplus/ (Deficit)
	On-street	*Commercial/ Station Parking*	*Residential*	**Total**		
37	49	30	9	88	70	18
38	66	55	44	165	101	64
39	50	21	37	108	136	(28)
40	66	0	6	72	171	(99)
41	60	0	71	131	62	69
42	0	0	0	0	55	(55)
43	55	57	0	112	73	39
44	48	0	0	48	83	(35)
45	65	0	18	83	145	(62)
46	56	20	3	79	147	(68)
47	53	35	10	98	64	34
48	47	0	2	49	47	2
49	55	0	0	55	45	10
Total	670	218	200	**1,088**	**1,198**	**(110)**

There are no paid parking facilities in the Soto project area.

The project area houses 2,399 residents in 779 dwelling units, and it employs 1,386 workers.

Average weekday ridership at the Soto Gold Line stop is 2,392. Average Saturday and Sunday ridership are only eight percent and 18 percent lower than average weekday ridership, respectively. This is the smallest such gap among all the project areas.

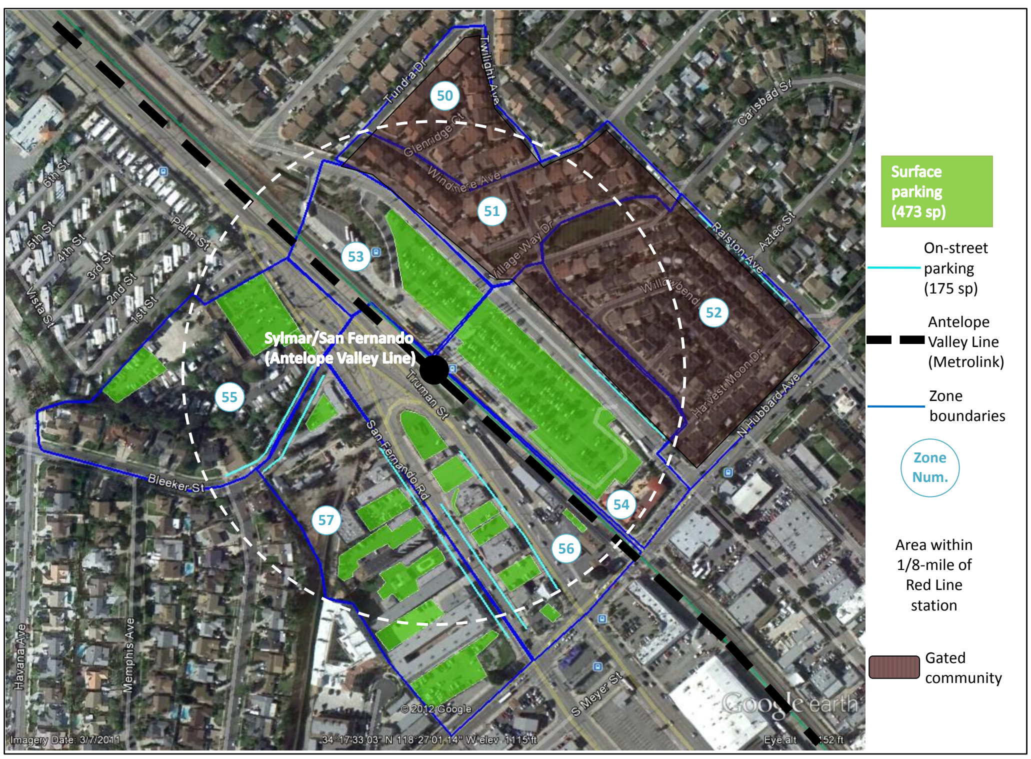
Sylmar Project Area

The Sylmar project area is located in the northern San Fernando Valley (see **Figure 12**), and it is the only project area centered around a commuter rail stop, rather than a Metro stop (subway, light rail, or bus-rapid-transit). The stop is served by Metrolink's Antelope Valley Line, with 60-minute frequency during peak hours and average daily ridership of 1,018.

The project area houses 1,080 residents in 364 dwelling units, and it employs 780 workers. Residential land use accounts for 50 percent of the total area, and the remainder is split roughly evenly between commercial uses and *Open Space/Public Facilities*. A total of 986 parking spaces were counted within the Sylmar study area. Surface lots supply 48 percent of these spaces, a lot designated specifically for use by

Table 20 shows the parking supply for the Sylmar project area. Metrolink riders supplies 34 percent, and non-metered on-street parking accounts for the remaining 18 percent. Residential parking accounts for 27 percent of total surface lot capacity. The area contains no observed parking capacity in structures or subterranean facilities.

Figure 12: Map of Sylmar Project Area



Peak-hour parking demand was estimated at 253 spaces, which is less than the parking supply in the project area, implying a parking surplus of 733 spaces.

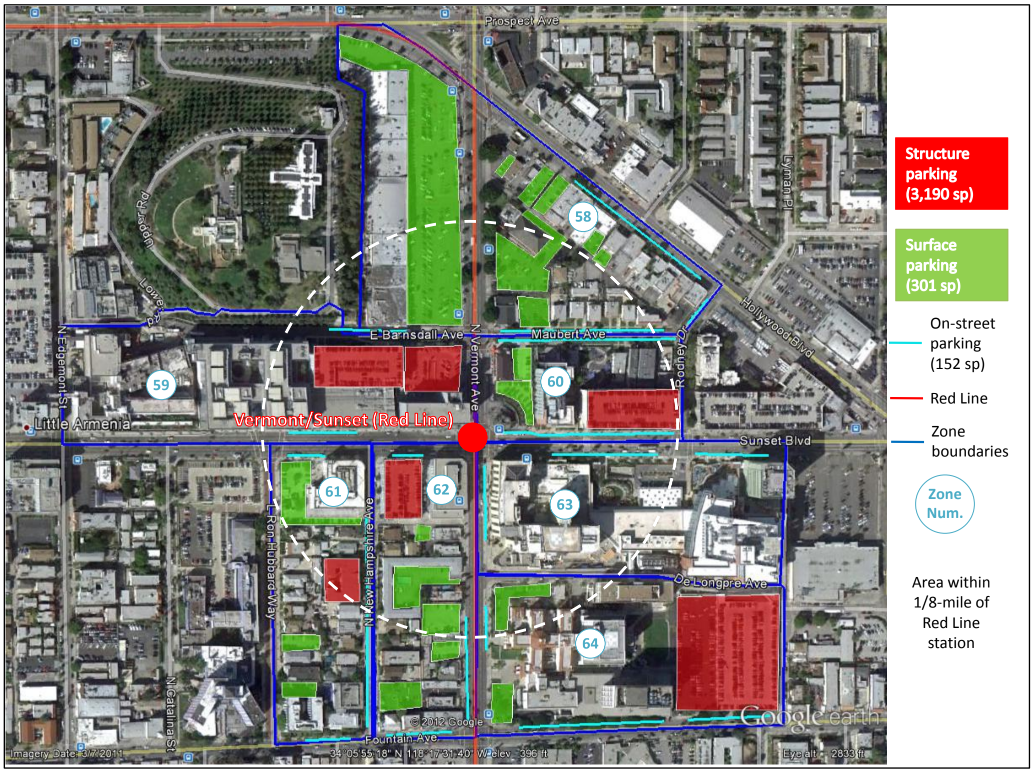
There are no paid parking facilities in the Sylmar project area. Note that roughly one-third of the project area is contained within a gated community, as shown in **Figure 12**. Since the gated community was not accessible during the in-field review, the parking capacity contained within this region was estimated by counting the number of dwellings that appear in the aerial photograph. All dwellings in the gated community appear to be single-family units, and it was assumed that there were two parking spaces per dwelling. Based on this assumption, the region within the gated community was estimated to contain 270 parking spaces.

Table 20: Actual Parking Supply vs. Peak-Hour Demand, Sylmar

Zone	Actual Parking Supply				Estimated Peak-Hour Demand (from model)	Surplus/ (Deficit)
	On-street	*Commercial/ Station Parking*	*Residential*	**Total**		
50	0	0	50	50	0	50
51	12	0	50	62	0	62
52	12	0	120	132	0	132
53	0	25	0	25	0	25
54	29	338	30	399	6	393
55	50	0	0	50	13	37
56	45	98	0	143	84	59
57	27	98	0	125	151	(26)
Total	175	541	270	**986**	**253**	**733**

Vermont/Sunset Project Area

Figure 13: Map of Vermont/Sunset Project Area



The Vermont/Sunset transit stop is located in East Hollywood (see **Figure 13**), and it is served by the Red Line, with 10-minute frequency during peak hours and average weekday ridership of 9,534.

Table 21 shows the parking supply for the Vermont/Sunset project area. A total of 3,643 parking spaces were counted within the Vermont/Sunset study area. Structures and subterranean parking facilities contain 88 percent of these spaces. The remaining capacity is provided by surface lots and on-street parking, which account for eight percent of and four percent of total capacity, respectively. Out of 152 total on-street spaces, 84 are metered. Commercial/non-residential parking accounts for over 90 percent of observed spaces in the *surface lot* and *structure/subterranean* categories.

Peak-hour parking demand was estimated at 6,002 spaces, which exceeds parking supply in the project area and implies a parking deficit of 2,359 spaces.

Table 21: Actual Parking Supply vs. Peak-Hour Demand, Vermont/Sunset

Zone	Actual Parking Supply				Estimated Peak-Hour Demand (from model)	Surplus/ (Deficit)
	On-street	*Commercial/ Station Parking*	*Residential*	**Total**		
58	56	472	0	528	1,349	(821)
59	8	1,050	0	1,058	2,722	(1,670)
60	27	940	0	967	33	934
61	36	50	60	146	367	(221)
62	46	741	0	787	120	667
63	14	0	0	14	1,234	(1,220)
64	21	650	0	671	177	494
Total	152	3,431	60	**3,643**	**6,002**	**(2,359)**

Table 22 shows the off street parking fees in the Vermont/Sunset area. Only two facilities in the project area charge for parking. Both are Kaiser Permanente parking structures, and both use the same pricing scheme, with the first 15 minutes free and a $4 maximum after one hour. These two structures provide a combined 43 percent of off-street parking capacity in the project area.

Table 22: Off Street Parking Pricing, Vermont/Sunset

Price	No. of spaces	Percent
0-15 min free; 16-60 min $2; over 1 hr $4; max $4	1,500	43%
Free	*1,991*	*57%*

*Excludes On-Street Parking

The Vermont/Sunset project area houses 406 residents, the fewest of any project area and it employs 2,191 workers, the most of any project area.

Land uses in the *Open Space/Public Facilities* category account for half of the total project area, with most of this space occupied by hospitals. Commercial land use accounts for another 35 percent of the project area, leaving the remaining 15 percent for residential use.

Wilshire/Western Project Area

Figure 14: Map of Wilshire/Western Project Area

Wilshire/Western is located in Koreatown (see **Figure 14**), and it is served by the Purple Line, with 10-minute frequency during peak hours and average weekday ridership of 9,244. The project area houses 1,373 residents in 976 dwelling units, and it employs 2,007 workers. Commercial land use accounts for 80 percent of the total area, making this the most heavily commercial project area (by land area). Table 23 shows the parking supply in the Wilshire/Western project area. A total of 3,918 parking spaces were counted within the Wilshire/Western study area. Structures and subterranean parking facilities contain 69 percent of the 4,488 total parking spaces in the project area. The remaining capacity is provided primarily by surface lots, which supply 27 percent of total capacity, leaving the remaining four percent to on-street spaces. All but 10 on-street spaces are metered, out of a total of 144.

Commercial/non-residential parking accounts for 88 percent of observed structure/subterranean spaces. Commercial/non-residential spaces outnumber residential spaces in the surface lot category as well, but by a much slimmer margin.

Table 23: Actual Parking Supply vs. Peak-Hour Demand, Wilshire/Western

Zone	Actual Parking Supply				Estimated Peak-Hour Demand (from model)	Surplus/ (Deficit)
	On-street	*Commercial/ Station Parking*	*Residential*	**Total**		
65	36	129	55	220	437	(217)
66	31	720	0	751	384	367
67	3	210	330	543	357	186
68	23	890	0	913	450	463
69	0	405	130	535	205	330
70	0	0	420	420	406	14
71	15	225	0	240	253	(13)
72	36	260	0	296	561	(265)
Total	144	2,839	935	**3,918**	**3,053**	**865**

Peak-hour parking demand was estimated at 3,053 spaces, which is less than parking supply in the project area and implies a parking surplus of 865 spaces.

Table 24: Off Street Parking Pricing, Wilshire/Western

Price	No. of spaces	Percent
$1.50 per 12 min; $15 max	780	18%
$1.75 per 15 min; $14 max	500	12%
$1 per 15 min; $10 max; $15 flat for events	425	10%
$2 per 20 min; $14 max	150	3%
$1 per 20 min + 10% tax; $7 max	109	3%
2 hrs free w/ library validation; $1/hr thereafter; $8 max	60	1%
Free	*2,320*	53%

*Excludes On-Street Parking

Table 24 shows the off-street parking fees in the Wilshire/Western are. More than half of the parking in this study area was found to be free, while other spaces had various pricing schemes. With only one exception for special events, all pricing at these facilities is marginal – a rate per fraction of an hour (typically 15 minute increments) – up until roughly two hours, when a maximum is reached. There is some variation in prices, which is presumably related to location, though there may also be some correlation with the quality of the facility itself. The survey indicated that parking costs in this area generally range from about $1.00 per 15 minutes up to $1.75 per 15 minutes. Maximum rates per day generally fall in the range of $7.00 to $15.00 per day.

Summary

The empirical field study data is summarized for all the project study areas in the figures below. **Figures 15 through 17** provide visual representations of the detailed data by each study area, and they offer some additional insight into comparison of the Study areas.

Figure 15 shows the parking capacity of each project area, broken out by *on-street*, *residential*, and *commercial*. It can be observed that parking supply is predominantly commercial in every area except Soto, where parking is mostly on-street. Also note that on-street parking spaces outnumber residential spaces in some areas, while the reverse is true in others. As noted, single family and small multi-family unit (i.e., duplex) parking is not included in the inventory.

Figure 15: Parking Spaces by Type

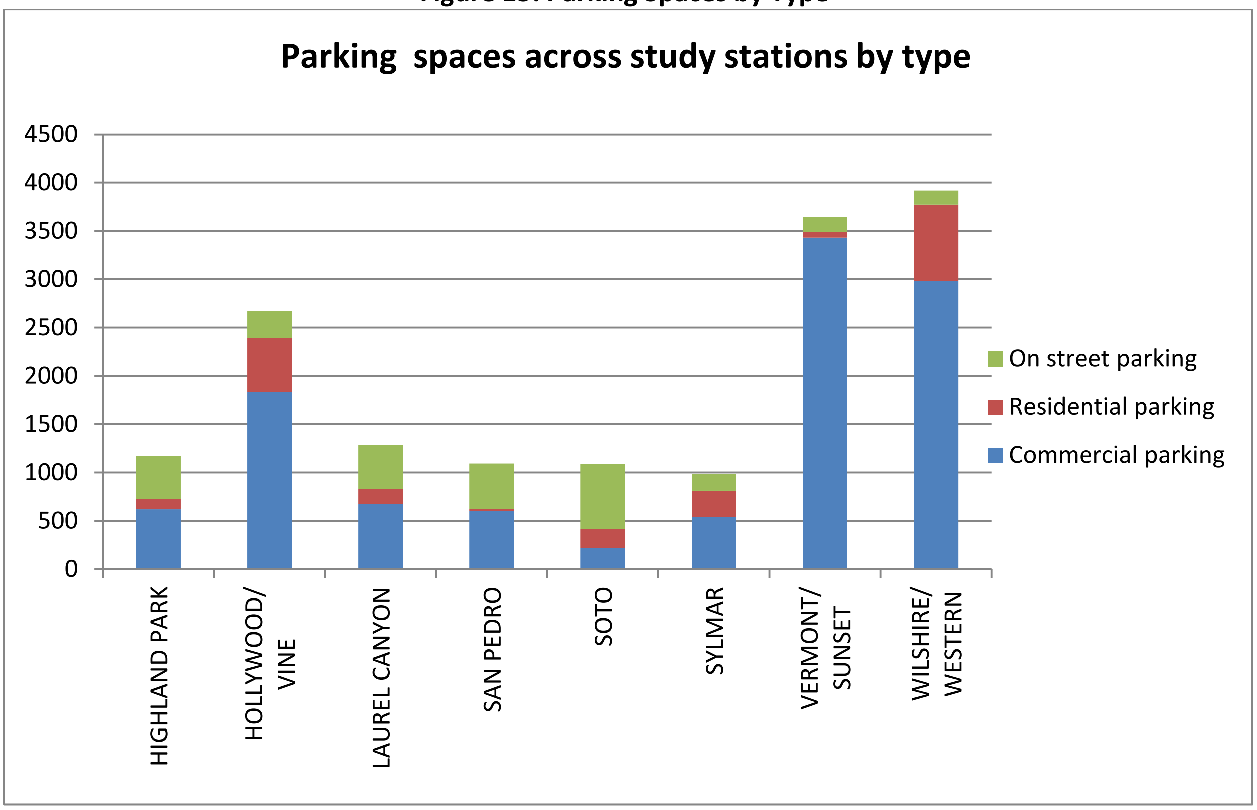


Figure 16 compares the parking supply in each project area with the population, employment, and number of dwelling units. In four of the project areas, the number of parking spaces exceeds both the number of residents and the number of employees. In two areas -- Vermont/Sunset and Wilshire/Western -- the number of parking spaces exceeds the number of residents and employees combined.

Figure 16: Parking Spaces and Demographics

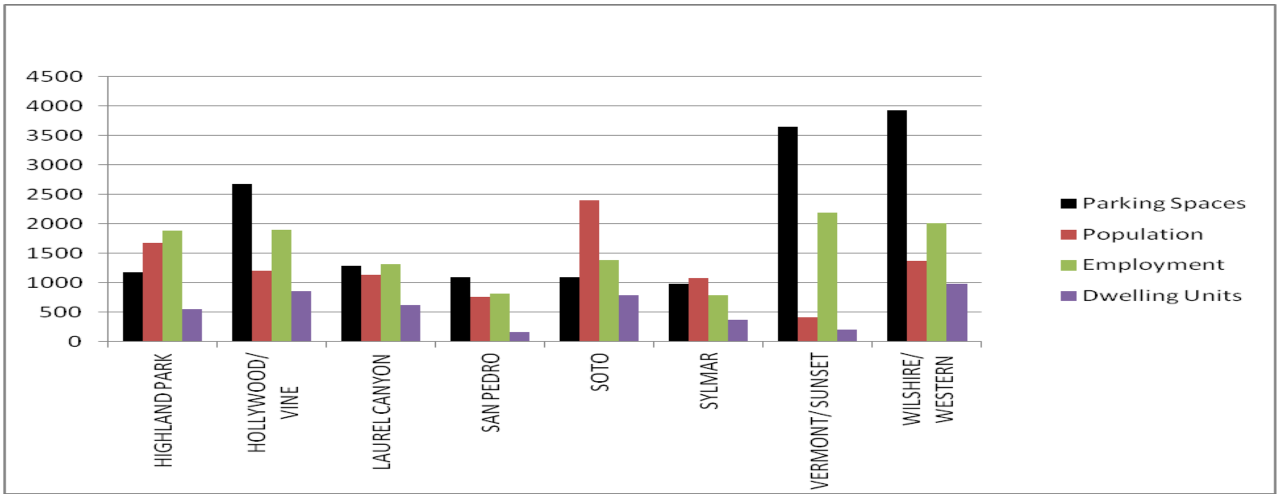


Figure 17 shows the proportions of land area occupied by each of four major categories of land use, for each project area.

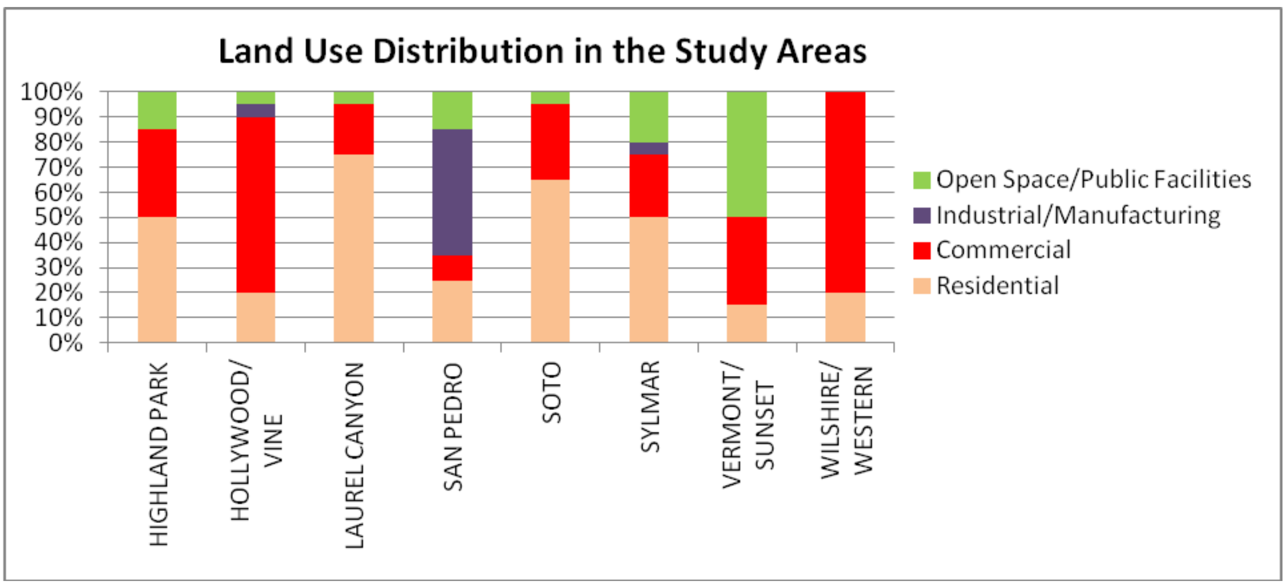


Figure 17: Land Use Distribution in the Study Areas

Chapter 6 – Parking Utilization and Occupancy Surveys

This chapter presents the results of the parking utilization and occupancy surveys. A discussion of the methodology and a summary of the results of the parking occupancy studies are included. Parking occupancy data were collected to capture peak hour (AM, mid-day, PM and nighttime) utilization during typical peak period conditions, and to identify time periods and locations of peak parking demand. The scope of services states that the collection of weekday versus weekend parking utilization data is to be based on the most relevant time period for each study area. The goal is to obtain the typical peak parking utilization in each study area as well as the most relevant data for the purposes of this TOD study in order to provide the best information related to parking demand and transit usage. Based on review of the land use characteristics at each study area, it was determined that the weekday represents the peak time period of demand at each study location for the following reasons:

- Residential parking peaks on weekday evenings and weekends when people are generally home from work and shopping. The on-street weekday nighttime surveys captured this peak time period. Off-street residential was not surveyed because it is all private, is not generally accessible and also does not directly relate to transit usage (the housing in these areas was built before transit for the most part and people do not make their decision to take transit based on whether they have parking at home in these study areas). Thus in terms of residential parking observations the weekday captures the peak time period of interest. Laurel Canyon, Sylmar and Soto have a majority of land uses dedicated to residential uses, thus the weekday evening period is the peak time of interest in these areas.
- Office parking peaks mid-day on weekdays and is very low on weekends. Any area with office uses would show extremely low (less than 10 percent) utilization of office space during a weekend survey.
- At Vermont/Sunset the Kaiser staff indicated there was no need to conduct surveys (nor did they allow surveys to be taken) But it was clearly indicated that parking is utilized fully on weekdays and less on weekends, in addition the nearby office space has lesser weekend demand. Thus in this study area the weekday information is most important, and it was provided qualitatively by Kaiser staff.
- Transit service and transit usage is significantly higher on weekdays than weekends in all of the study areas. The Saturday transit usage is lower than the weekday by the following percentages: Wilshire/Western – 41 percent, Laurel canyon – 36 percent, Vermont/Sunset – 35 percent, Highland Park – 30 percent, San Pedro – 24 percent, Hollywood/Vine – 17 percent, Soto eight percent and Sylmar has one half the number of Metrolink train service on the weekend. Based on transit usage, weekdays are clearly the time period of interest when assessing parking and associated transit demand.
- Sundays are never used for parking studies given their atypical activity characteristics as compared to the remainder of the week, thus the only weekend day of interest is Saturday. The weekday survey findings thus apply to five days of the week whereas a weekend survey would only provide relevant information for one day, Saturday, and even that data would be misleading for most of the study areas due to the reasons noted herein.

Parking Occupancy/Utilization

Parking occupancy or parking utilization refers to the number of spaces occupied at any given time of day and typically the peak hour of occupancy is the focus of analysis. Occupancy during peak periods is the primary measure of parking usage and helps understand the need for additional parking.

Occupancy rates at 85 to 90 percent are generally considered the peak desirable occupancy because above that point motorists must search for available parking and/or may be tempted to park illegally both on-street (in red zones or loading zones) and off-street lots (in parking aisles and other unmarked locations). In addition, occupancy between 85 to 100 percent does not allow flexibility for special circumstances or events. Thus when evaluating parking we look at the “effective” supply instead of the full supply. The effective supply is the maximum number of parking spaces that can efficiently be used within a given system. Off-street parking typically is considered to be more or less fully occupied at around 85 to 90 percent, depending on the type of facility and the anticipated user group.

Parking occupancy for the study area is summarized in charts within in this chapter. Included in these charts are all spaces observed except for off-street residential areas and off-street commercial lots which could not be surveyed. Off-street purely residential parking supply was not considered relevant to this study because it is privately owned and is not available to anyone except the residents. Also, the team was unable to gain access to conduct surveys at private residential parking locations. Larger commercial parking lots were the focus of the off-street surveys.

Selection of Off Street Lots for Utilization Surveys

The team identified the largest lots in each study area, and then contacted lot operators to seek permission to conduct the surveys. In some cases, it was possible to survey the utilization entirely from outside of the lot and thus no permission was needed. The methodology to select the sites to survey included:

- Identify all of a site’s parking facilities—including the total number of parking spaces. This was a simple confirmation of what was reported by the property manager during the telephone contact in the previous task, confirmation of what was reported from Internet based research, or asking the property manager (or appropriate property authority) while on-site.
- Use maps of the parking facilities to designate proposed routes for the survey field crews to conduct the parking utilization survey efficiently and accurately with minimal impact on residents.
- Following this pre-survey work the team confirmed the total parking supply and later generated maps and proposed routes for the survey field crews to follow for the peak parking utilization survey.

Data Collection and Methodology

Data were collected on a typical weekday (Tuesday, Wednesday or Thursday) in the eight study areas. To determine occupancy, all of the data were collected manually with hourly notations made as to whether or not each observed parking space was occupied by a vehicle.

Based on best practices for conducting parking utilization surveys, the peak parking utilization surveys were conducted mid-week between the hours of 9:00 a.m. and 10:00 p.m. during selected hours. For this study,

- 'AM peak' period refers to the survey conducted between 7-9AM,
- 'Mid-day' peak refers to the survey conducted between 12-2PM,
- 'PM peak' period refers to the survey conducted between 4-6PM and
- 'Night time' peak period refers to the survey conducted between 8-10PM.

Surveys were conducted by survey field crews of two or three members. The recommended approach was to have one team member drive, while the other one or two count. This assignment allowed data collectors to focus on data collection, while drivers focused on maneuvering through the streets and parking sites. Initially, there were 34 larger off-street parking lots considered for utilization surveys. Ultimately, the team was able to survey 21 lots for on-the-ground parking surveys. Table 25 provides additional details regarding the list of parking lots that were chosen for the utilization surveys.

After completing the pre-survey tasks, the team conducted the on-site parking surveys. This chapter summarizes factors that were considered during the on-site surveys, background information on the use of parking utilization as a measure of parking demand, data that was collected, and finally the data analysis and conclusions from the effort.

As noted, the utilization surveys covered two types of parking:

- Off-street parking (including all publicly owned lots and a significant sample of the total off-street private parking)
- On-street parking (including 100 percent of all metered and non-metered on-street parking spaces in each study area)

<u>Off-Street Parking Surveys</u>

Off-street parking is defined as parking that is generally available to the residents, employees and visitors located in the vicinity of the TOD area, both on private property (may or may be not accessible to the general public) and public lots. City owned public lots as well as transit station related lots were also included in this sample. Loading zones were not included in the parking supply survey, unless a parking violation existed. For vehicles other than automobiles (motorcycles, ATVs, golf carts, etc.), if any one of them was parked in a space intended for an automobile, the space was counted as occupied. While the parking spaces are meant for automobile use, any other type of vehicle parked in them was considered to contribute to parking utilization.

A total of 34 larger size off-street lots were initially chosen to be surveyed as part of the parking utilization study. These lots were chosen on the basis of total number of parking spaces (at least 40 or more parking spaces). Out of these larger off-street lots, the residential lots were removed from the list because the team could not gain access to enter private residential properties. After removing the residential lots and other smaller private lots with restricted entry from the list, 25 large off-street lots remained for survey. Out of these lots, the survey team with the assistance of the sub-consultant, Parking Design Group was able to secure permission and survey 21 parking lots. The remaining four lots were part of the hospital lots in the Vermont and Sunset study area, which Kaiser declined to allow surveys but for which Kaiser staff also indicated they are 100 percent occupied on weekdays.

Table 25 provides a detailed summary of the methodology and outreach for the parking utilization survey. In summary, the survey covers nearly all of the major large off-street parking at each study area with the exception of the hospital lots, and other information was used to supplement the hospital utilization results, thus they are also represented.

Table 25: Parking Lots Included in Utilization Survey

STUDY AREAS	LARGEST LOTS	TOTAL SPACES	COUNTED	NOTES
Highland Park	Public Lots (3 Lots)	223	YES	All counted
	On-Street	444	YES	All on-street counted
Hollywood/Vine	Hotel + Residential + Mixed Use	750	YES	250 out of the total 750 spaces were counted. The remaining parking spaces had restricted access because it was part of a hotel and private residential parking
	Coast Parking	380	YES	All counted
	Sunshine Auto Parks	500	YES	All counted
	Safety Parking	142	YES	All counted
	Standard Parking	60	YES	All counted
	Residential Lots	180	NO	No access to private residential
	On-Street	282	YES	All on-street counted
Laurel Canyon	Commercial Lots (2 Lots)	162	YES	All counted
	Commercial Lot-Structure	280	YES	All counted
	Residential Lots	120	NO	No access to private residential
	On-Street	454	YES	All on-street counted
San Pedro	Commercial Lots (2 Lots)	85	YES	All counted
	On-Street	469	YES	All on-street counted
Soto	On-Street	670	YES	All on-street counted
Sylmar	Metrolink	270	YES	All counted
	Residential Lots	50	NO	No access to private residential
	On-Street	175	YES	All on-street counted
Vermont/Sunset	Hospitals (4 Lots)	3000	NO	Were able to meet with the hospitals operations representative to discuss parking usage and other issues. Hospital stated no need to conduct survey as utilization typically exceeds 100% (via use of attendant on site)
	Commercial Lot	400	YES	All counted
	Residential Lot	40	NO	No access to private residential
	On-Street	152	YES	All on-street counted
Wilshire/Western	King Valet	109	YES	All counted
	City Valet	200	YES	All counted
	Standard Parking	900	YES	All counted
	Modern Parking	750	YES	All counted
	Commercial Lots	325	YES	All counted
	Residential Lots	450	NO	No access to private residential
	Public Library	60	YES	All counted
	On-Street	144	YES	All on-street counted

On-Street Parking Surveys

On-street parking is defined as parking that is generally available to visitors, employees and sometimes specifically assigned to residents via permit parking districts. Both metered and non-metered parking was counted as part of the utilization study. All on-street parking spaces were surveyed as part of the utilization study.

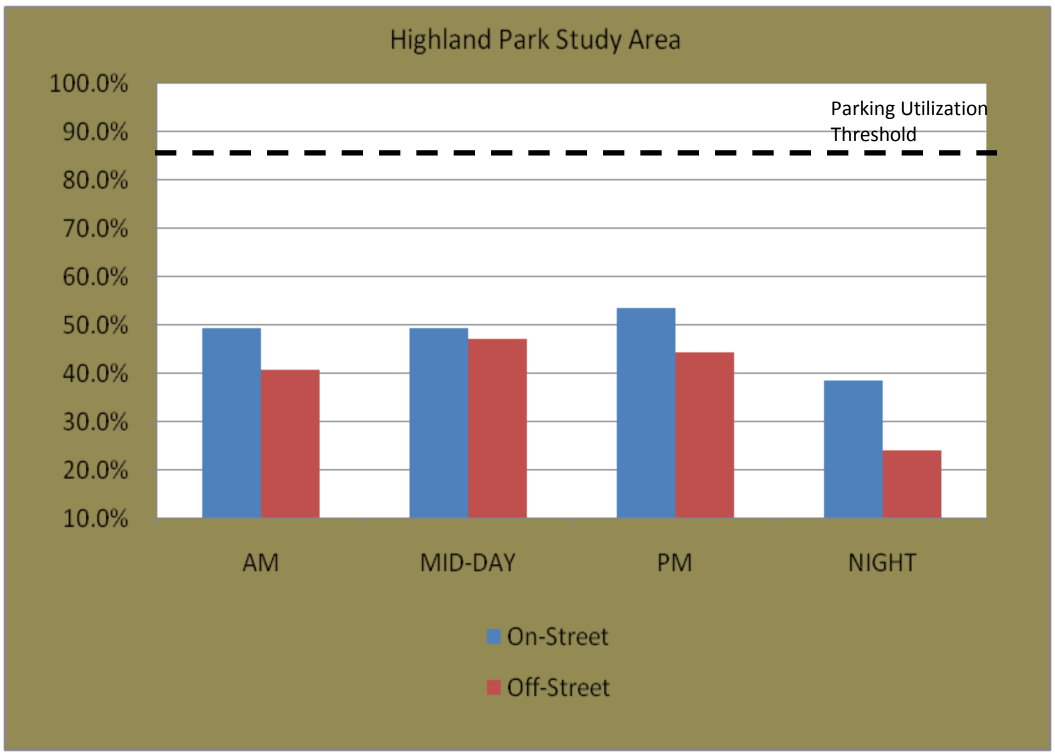
Findings of the Parking Utilization Survey

Below are the findings developed from surveying each of the study areas for parking utilization during peak hours. An area by area summary is provided.

Highland Park Study Area:

Figure 18 illustrates the results of the parking utilization survey in this case study area. The Highland Park study area consists of 11 zones/blocks. As The total study area has about 444 on-street parking and 726 off-street parking spaces. The major lots in this study consist of three city owned public lots of 62, 77 and 82 parking spaces each. The peak utilization for on-street parking was observed during the PM peak period with about 54 percent utilization rate. For the off-street parking that was surveyed, the peak utilization rate of 47 percent was observed during the mid-day period.

Figure 18: Parking Utilization Rates in Highland Park Project Area

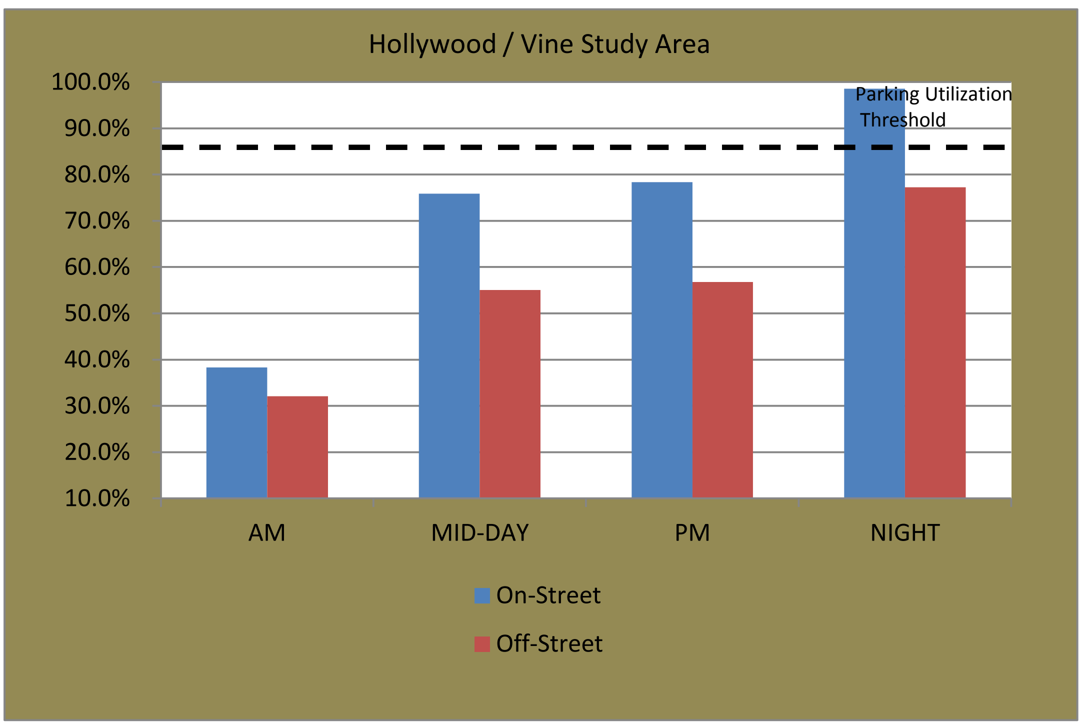


<u>Hollywood/Vine Study Area:</u>

Figure 19 illustrates the results of the parking utilization survey in this case study area. The Hollywood/Vine study area consists of eight zones/blocks. The total study area has about 282 on-street parking and 2,391 off-street parking spaces. The major off-street parking lots in this study area are Safety Parking approximately 150 spaces), Sunshine Auto Park (approximately 500 spaces), and Coast Parking (approximately 380 spaces). The parking utilization team was able to survey approximately 1,400 off-street spaces. The spaces that were not surveyed were because of restricted entry due to the spaces being associated with either private residential or a hotel.

Peak utilization for on-street parking was during the night time peak period with about 98 percent utilization rate. For the off-street parking that was surveyed, the peak utilization rate of 79 percent was observed during the night time peak period. The peak period for both the on-street and off-street parking was observed during the night time period presumably because of the land use activity (theaters, hotel and restaurants) in the study area which all peak at night.

Figure 19: Parking Utilization Rates in Hollywood/Vine Project Area



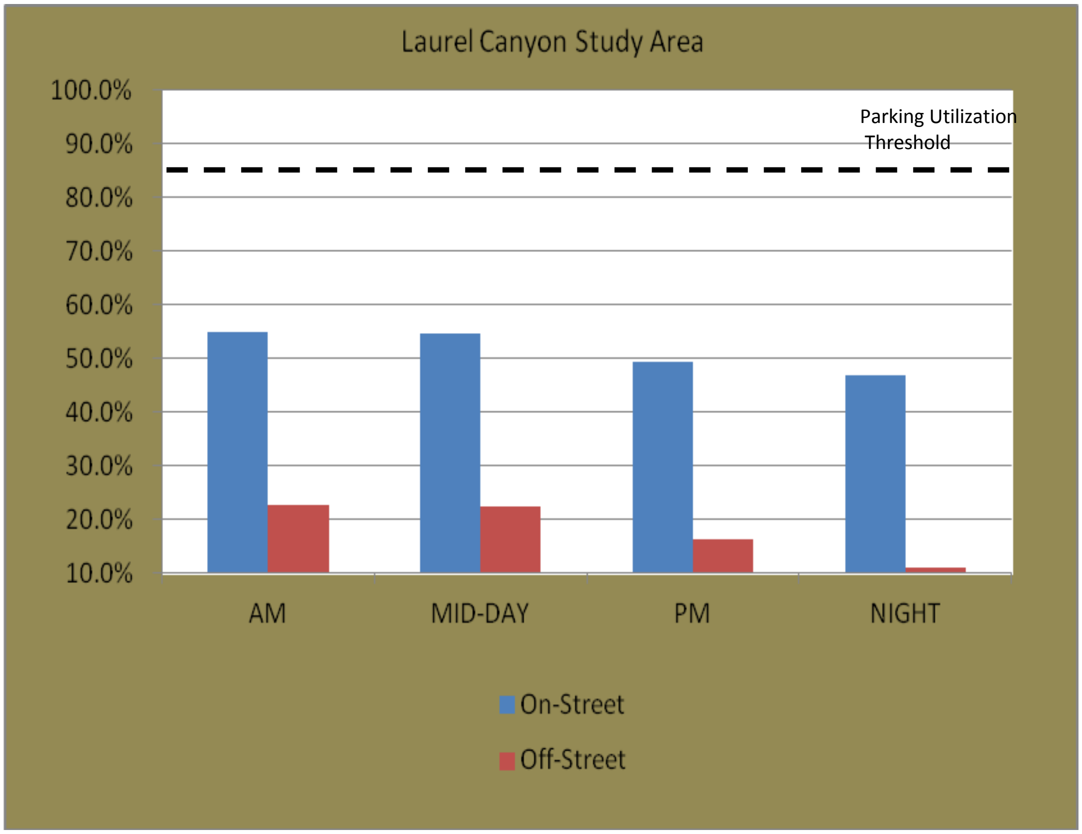
<u>Laurel Canyon Study Area:</u>

Figure 20 illustrates the results of the parking utilization survey in this case study area. The Laurel Canyon Study area consists of eight zones/blocks. The total study area has about 454 on-street parking

and 832 off-street parking spaces. The major lot in this study consists of a commercial public lot of 200 spaces.

Peak utilization for on-street parking was observed during the AM peak period with about 54 percent utilization rate. For the off-street parking that was surveyed, the peak utilization rate was observed during the AM peak period with about a 25 percent utilization rate.

Figure 20: Parking Utilization Rates in Laurel Canyon Project Area

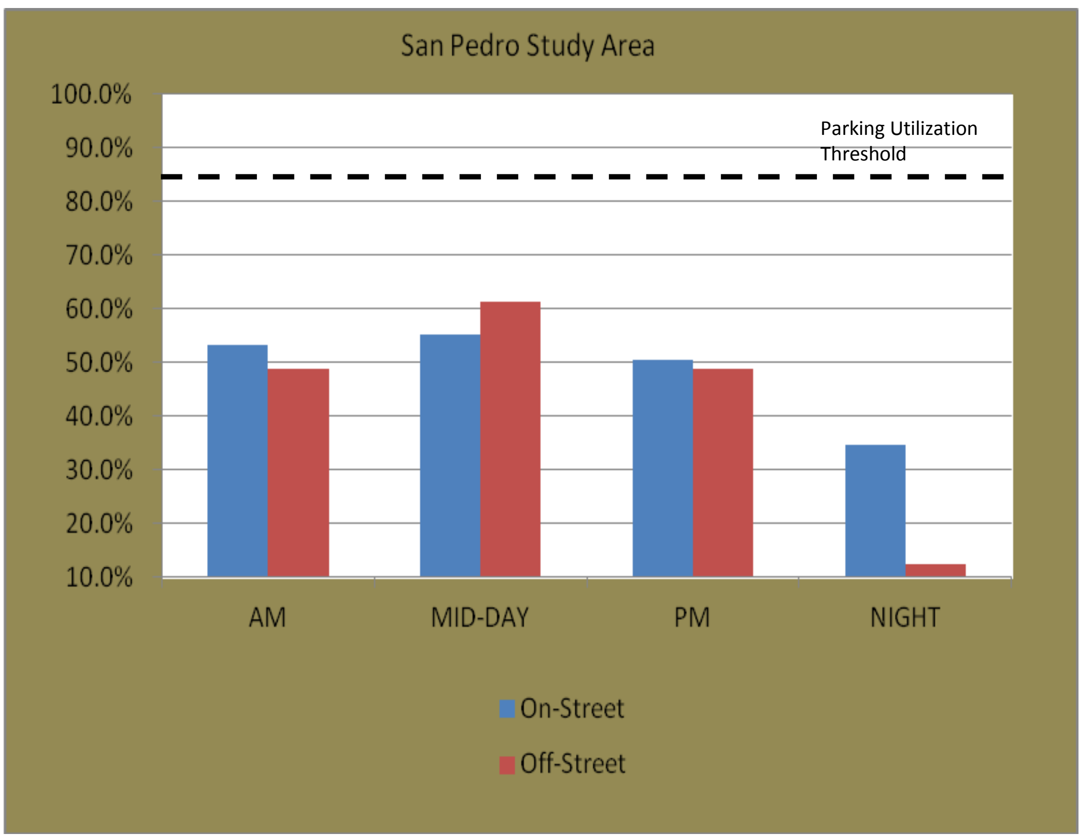


San Pedro Study Area:

Figure 21 illustrates the results of the parking utilization survey in this case study area. The San Pedro Study area consists of nine zones/blocks. The total study area has about 469 on-street parking and 624 off-street parking spaces. The largest parking lot in the study area is a 240 space school bus driver lot underneath the freeway which was not surveyed due to its unusual and specific use serving bus drivers. The other major lots in this study consist of two city owned public lots of 40 and 45 parking spaces each (which were surveyed).

Peak utilization for on-street parking was during the mid-day peak period with about 55 percent utilization rate. The peak utilization for the off-street parking that was surveyed was also during the mid-day peak period with about 61 percent utilization rate.

Figure 21: Parking Utilization Rates in San Pedro Project Area

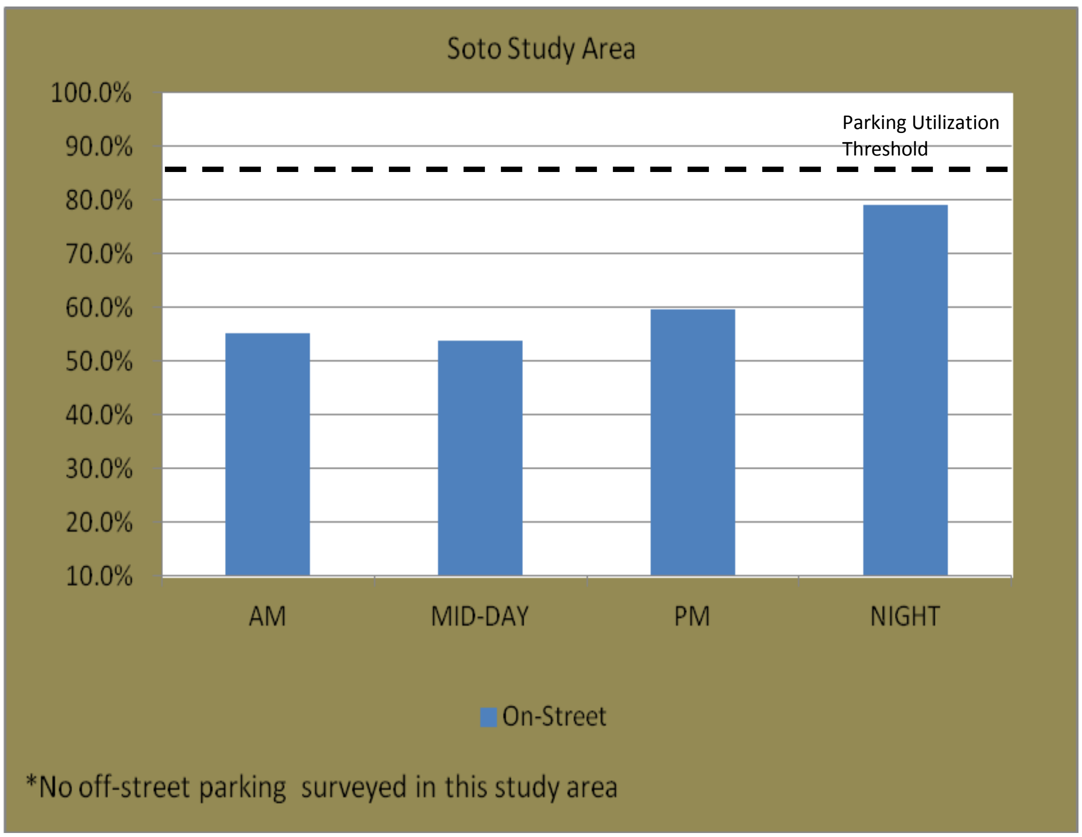


<u>Soto Study Area:</u>

Figure 22 illustrates the results of the parking utilization survey in this case study area. The Soto Study area consists of 12 zones/blocks. The total study area has about 670 on-street parking and 400 off-street parking spaces. There are no major non-residential parking lots (of over 40 spaces) in this study area, and thus none met the criteria for the off-street survey. Most of the off-street parking in the Soto study area is residential parking. There were no public lots in this study area.

Peak utilization for on-street parking was during the night time peak period with about 79 percent utilization rate.

Figure 22: Parking Utilization Rates in Soto Project Area

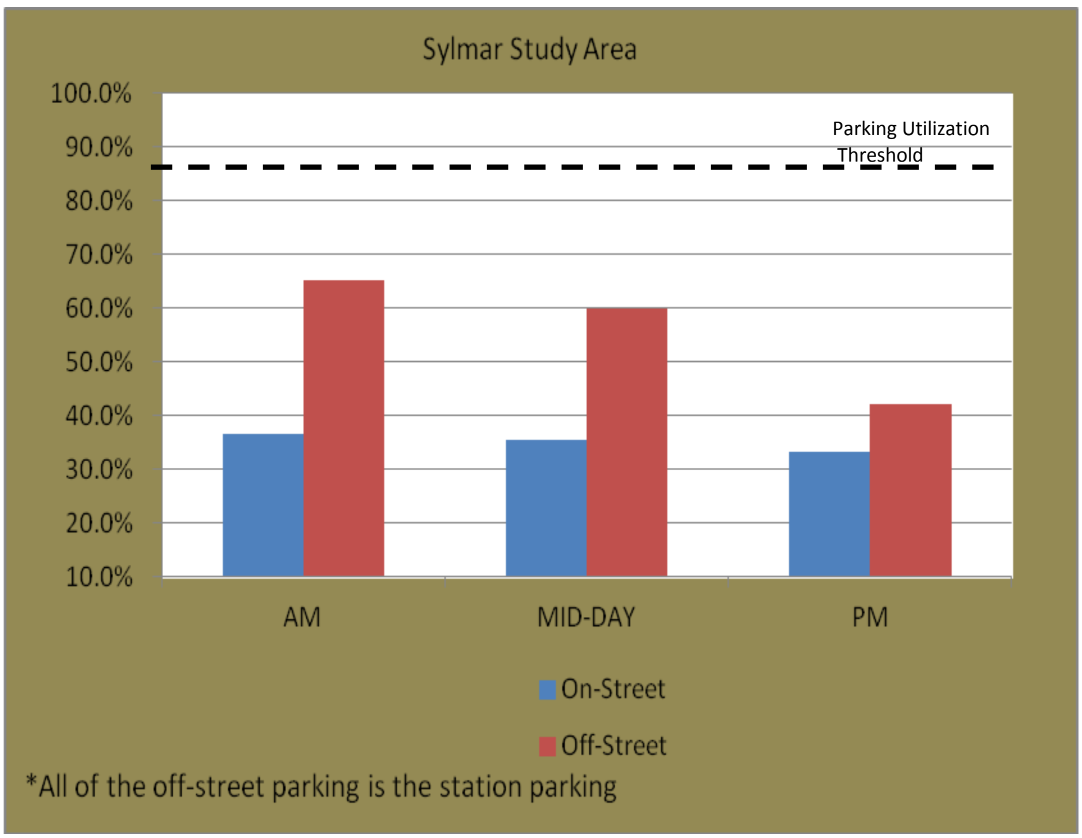


<u>Sylmar Study Area:</u>

Figure 23 illustrates the results of the parking utilization survey in this case study area. The Sylmar Study area consists of eight zones/blocks. The total study area has about 175 on-street parking and 811 off-street parking spaces. The major lot in this study consisted of the Metro Link station parking lot containing 338 spaces, which was surveyed.

Peak utilization for on-street parking was during the AM peak time with about 36 percent utilization rate. The peak utilization for off-street parking that was surveyed was also during AM time with about 64 percent utilization rate. Utilization rates declined after the morning to the mid-day and further in the PM period.

Figure 23: Parking Utilization Rates in Sylmar Project Area

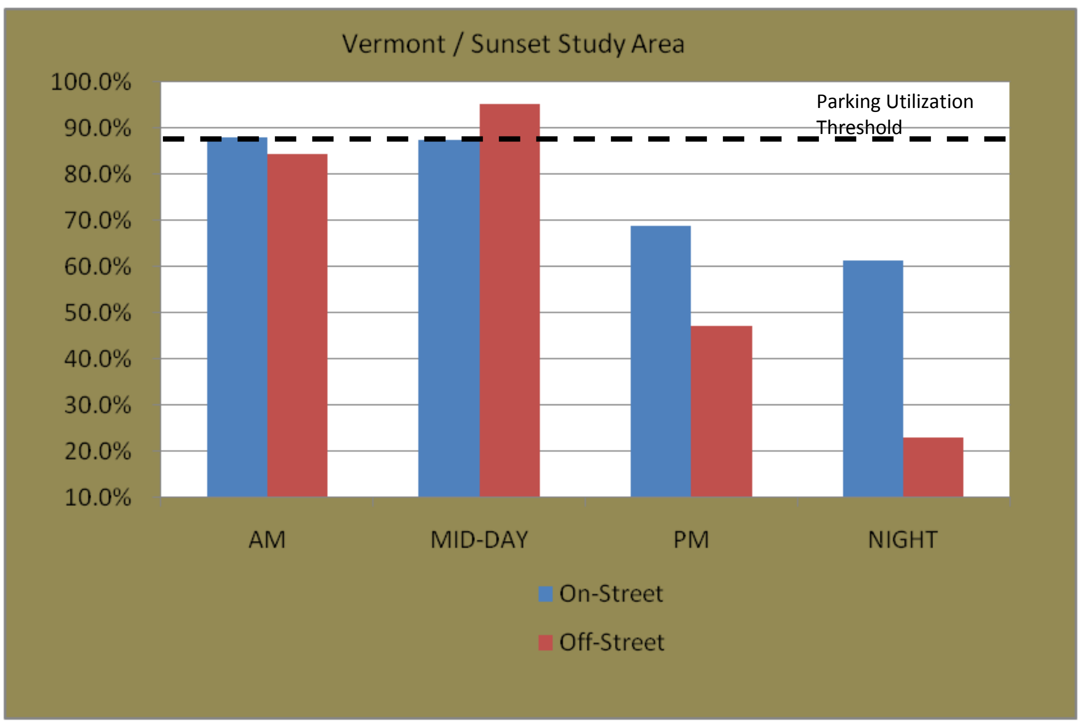


Vermont/Sunset Study Area:

Figure 24 illustrates the results of the parking utilization survey in this case study area. The Vermont/Sunset Study area consists of 7 zones/blocks. The total study area has about 202 on-street parking and 3,461 off-street parking spaces. The major lots in this study consist of three Kaiser Hospital owned lots and one Children's Hospital lot. More than 90 percent of the total off-street parking supply in this study area is associated with the hospitals (Kaiser approximately 2,400 parking spaces and Children's Hospital with approximately 600 parking spaces). According to a Kaiser Permanente officer, Kaiser uses all of its parking during peak hours and even leases additional parking near the medical campus in addition to employing "stack parking" whereby more than 100 of spaces are effectively used during peak hours. Thus, the hospital oriented off-street parking utilization in this study area is near 100 percent during peak hours.

Peak utilization for on-street parking was during the AM peak time with about 88 percent utilization rate. Off-Street parking peaks mid-day with about 95 percent utilization and it is also very high in the morning (about 84 percent) when hospital activity is at a high level.

Figure 24: Parking Utilization rates in Vermont/Sunset Project Area

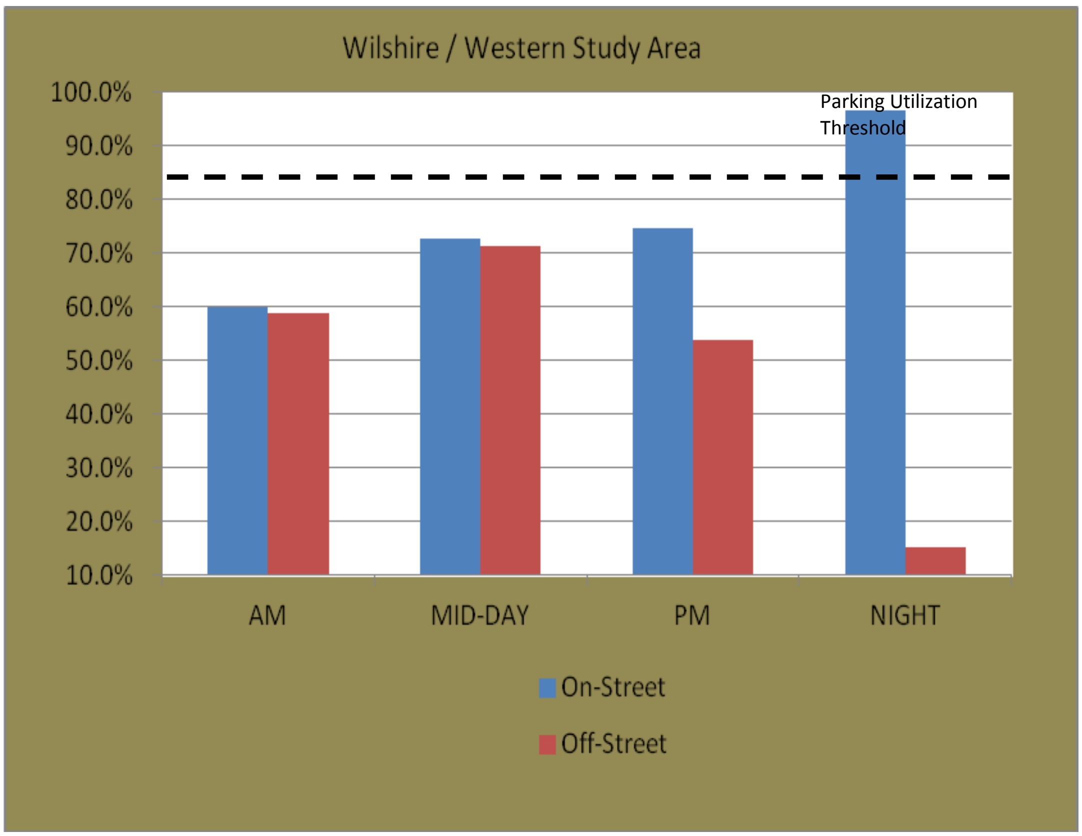


ilshire/Western Study Area:

Figure 25 illustrates the results of the parking utilization survey in this case study area. The Wilshire/Western Study area consists of eight zones/blocks. The total study area has about 204 on-street parking and 3,714 off-street parking spaces. Some of the major lots in this study consist of a 'City Valet' lot (with approximate 200 spaces), a 'Modern Parking' lot (with approximately 750 spaces) and a 'Standard Parking' lot (with approximately 700 spaces). Based on outreach to parking operators, several of the large private off-street lots in this study area were surveyed.

Peak utilization of on-street parking was observed during the night time peak period with about 97 percent utilization rate and during the daytime and mid-day over 70 percent of on-street parking was used. The peak utilization for off-street parking that was surveyed was observed during mid-day peak period with about 72 percent utilization rate. Night time off-street parking dropped significantly due to the office land uses in the area.

Figure 25: Parking Utilization rates in Wilshire/Western Project Area

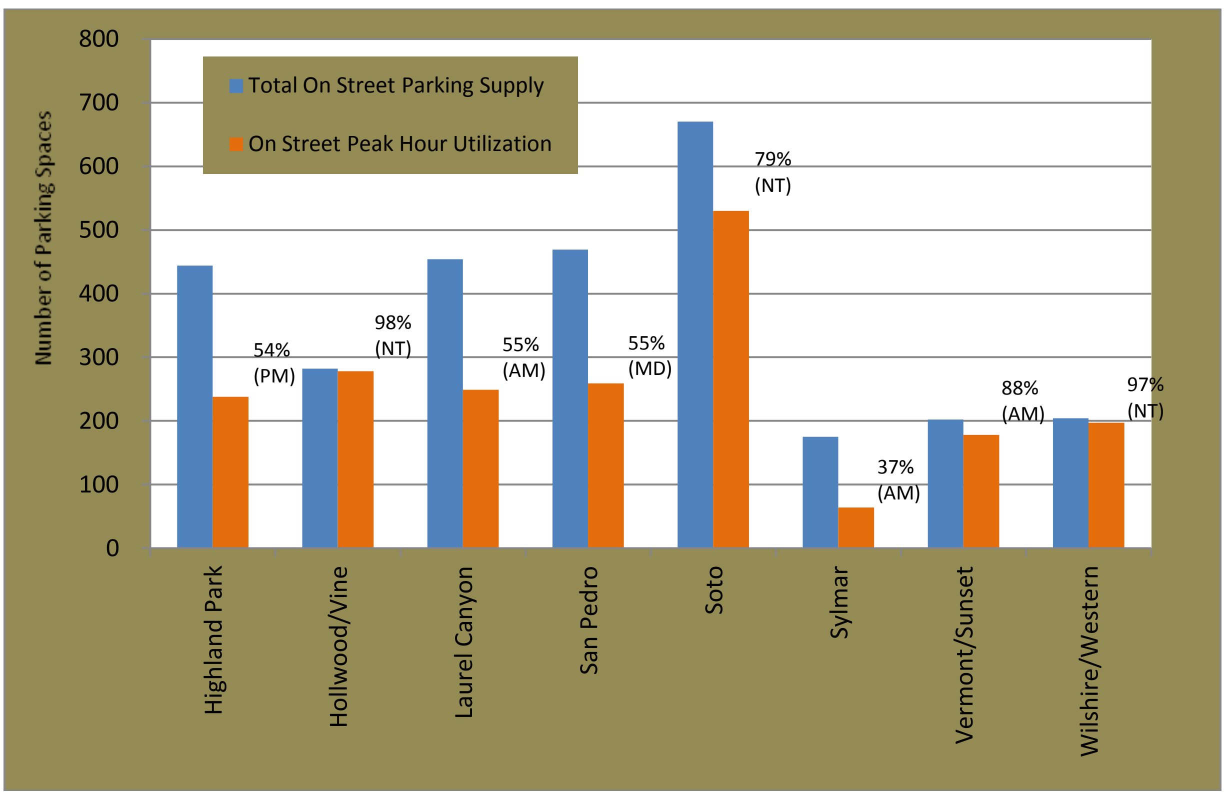


Summary of Parking Utilization Surveys

Figures 26 and 27 summarize the peak hour results of the on and off-street parking utilization surveys for the eight study areas, respectively. The data shown for each study area represents the peak hour time period for that respective area, whenever it was measured (AM, mid-day, PM or night). As shown for on-street parking, three of the study areas experienced peak hour parking utilization near or over 90 percent (Hollywood/Vine, Vermont/Sunset and Wilshire/Western). One location (Soto) had on-street occupancy near 80 percent and the remaining four locations had on-street peak parking occupancy of 55 percent or lower.

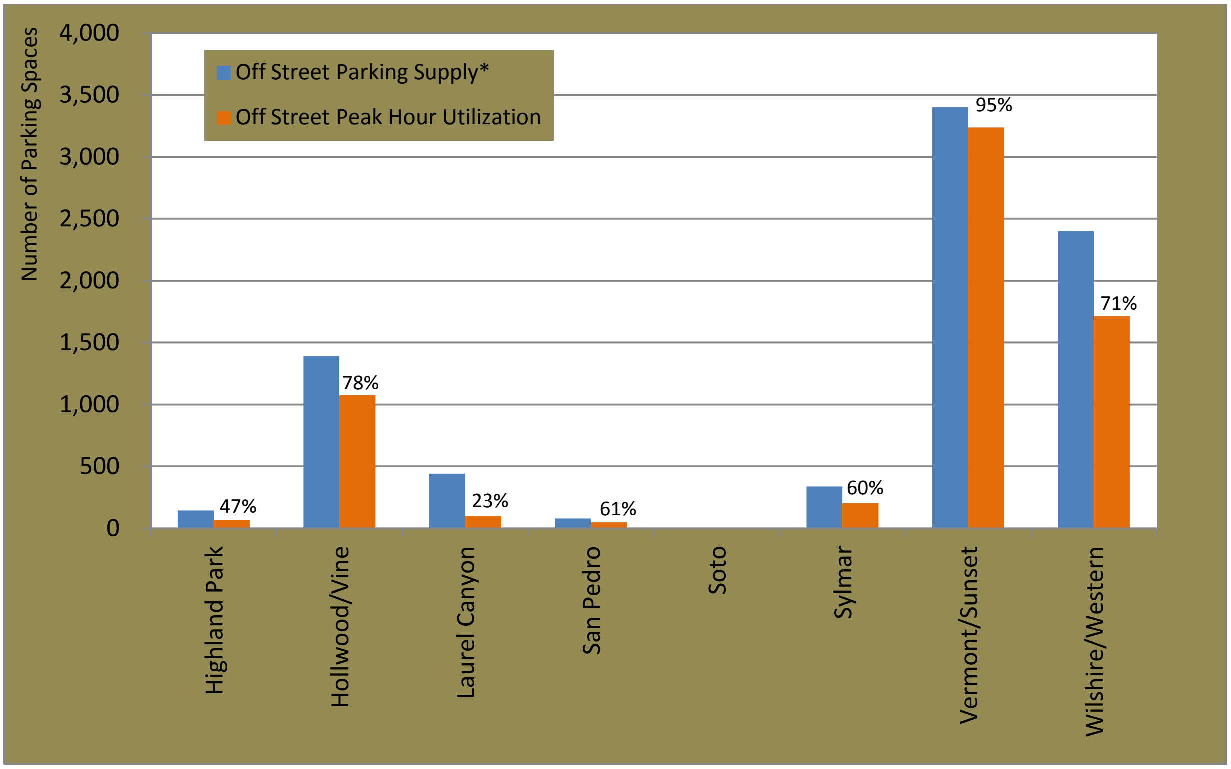
As shown for off-street parking, three areas have off-street parking demand exceeding 70 percent (Vermont/Sunset, Hollywood/Vine and Wilshire/Western) while the remaining study areas experienced off-street occupancy at or below 65 percent.

Figure 26: On-Street Parking Utilization Survey Results



Note - AM-AM period; MD-Mid day period; PM-PM period; NT-Night time period

Figure 27: Off-Street Parking Utilization Survey Results



* Only the off-street parking supply that was surveyed is included in this chart (total off street spaces are greater)

In-Person Parking and Public Transportation Survey at Wilshire/Western

A "person on the street" survey was conducted in May 2012 for the purpose of better understanding the travel and parking characteristics of a group of people in one of the study areas. The Wilshire/Western study area was chosen due to the assistance of the Wilshire Center Business Improvement Corporation. While not intended to be a statistically significant sample of travelers in the area, the survey helps the team to understand some general trends related to parking and use of transit in this TOD location. The survey asked a series of questions regarding mode of travel, parking and public transportation. The survey took place in at 3700 Wilshire Boulevard, next to the Wilshire Boulevard and Western Avenue Metro bus stop, a LADOT DASH bus stop, and a Starbucks Coffee shop. Individuals were asked a series of seven questions (listed below) and asked to pick one of the following answers. A total of 33 surveys were collected; two of which were translated into Spanish.

1. What is your purpose for visiting the area?
    - Work
    - Shopping
    - Restaurant
    - Movie
    - Gym
    - Multiple Purposes
    - Other

2. How did you get here today?
    - I drove
    - I was a passenger in a car
    - Metro rail train
    - Bus
    - Walked
    - Biked
    - Other

3. If you drove, where did you park?
    - Parking Lot/Structure
    - Curb-Side On-Street
    - Other

4. Did you pay for parking?
    - Yes
    - No, I found free parking
    - Employer pays for parking
    -

5. If you took public transportation (bus/train), what was the primary factor in making your choice?
    - Don't own a car, so I always use public transportation

- Public Transportation is more convenient for me
- Driving and parking is too expensive
- Other

6. If you drove and parked, what could cause you to switch to using public transportation?
    - Nothing, I will always drive and park
    - If public transportation was more convenient, then I would use it
    - If parking and driving becomes too expensive, then I would use public transportation
    - Other

7. Do you use the Metro Purple Line at the Wilshire/Western station?
    - No, I have never ridden the Metro Purple Line
    - Yes, I have occasionally used the Metro Purple Line
    - Yes, I often use the Metro Purple Line (more than once a week on average)

A summary of the survey results is provided below. It should be noted that in several surveys, some individuals erroneously marked answers that did not apply to their mode of transportation (i.e. individuals who drove marked questions for those who took public transportation, and individuals who took public transportation answered questions regarding driving and parking). In those cases, the results were interpreted based on the likely intent of the respondents answer, and false results are omitted from the final survey conclusions.

Purpose of Visiting the Area

The trip purpose results of the survey indicate 49 percent were at the site for work-related purposes, 24 percent were there to shop, 15 percent where there for multiple purposes, six percent were there to eat at a restaurant, three percent were there to go to the gym (see **Figure 28**). Respondents who provided an explanation of why they answered "multiple" or "other" indicated that their trip purpose was to go to a nearby coffee shop, to study, to travel, or they were at the site because they live in the area.

Mode of Travel

The mode split results of the survey indicate that 34 percent walked to the site, 33 percent took public transportation (three quarters of those by bus, one quarter by Metro rail), 27 percent drove in a private automobile, and six percent rode a bicycle (see **Figure 29**). Overall, over nearly two-thirds of the respondents at the site did not travel in a private automobile, but via walking, biking or public transportation. It should be noted that one-quarter of respondents indicated that they arrived at the site via multiple modes of transportation including combinations of walked to the site, drove then biked to the site, took the bus then walked to the site, took the Metro train then walked to the site, and biked then walked to the site. For the purposes of the survey, the primary mode used for the majority of the trip was recorded.

Figure 28: Trip Purpose

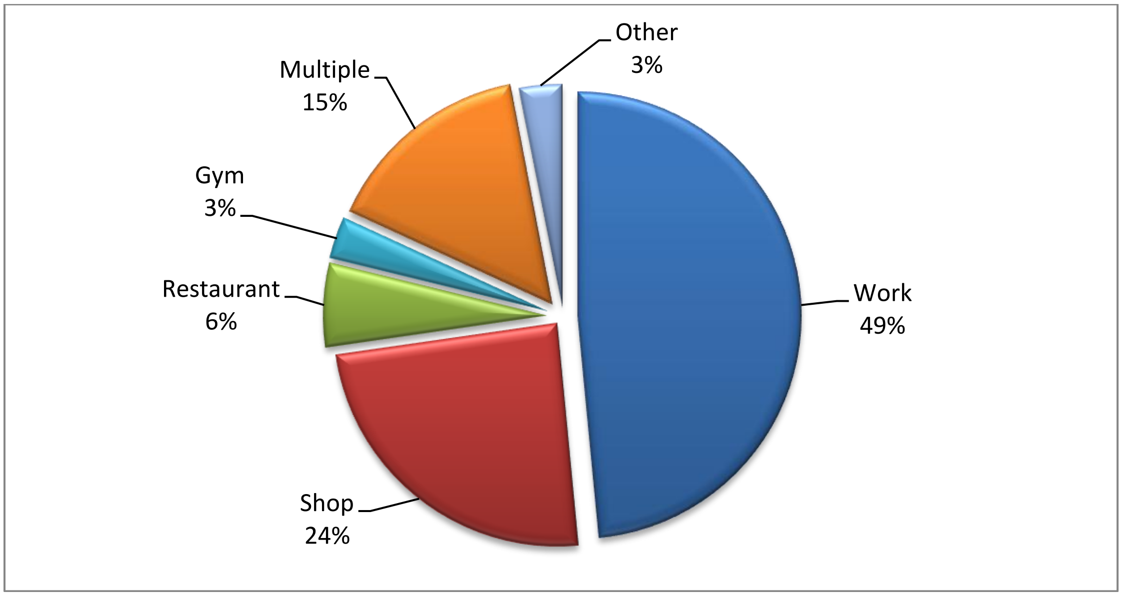
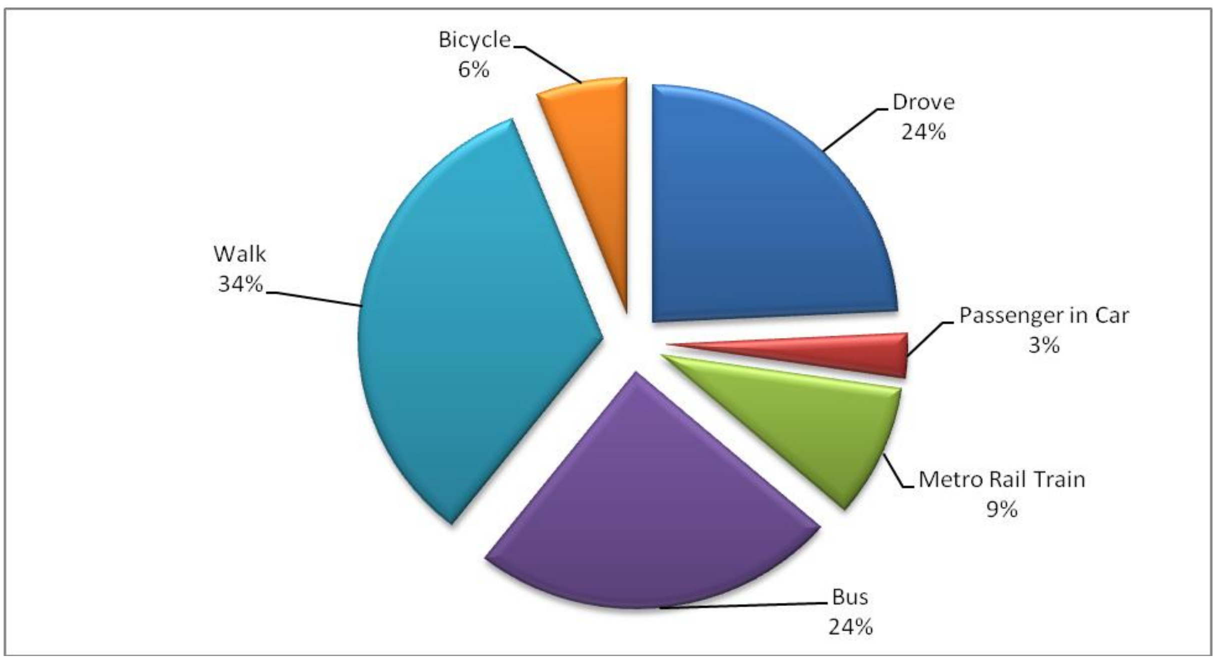


Figure 29: Mode Split – Primary Mode of Travel



Survey Results for Respondents Who Drove

Twenty-seven percent indicated on their survey that they either drove to the site or were a passenger in a private automobile. All of the respondents who arrived at the site via private automobile parked in a parking lot or structure, and two-thirds of those paid for parking while one third stated that their employer paid their parking fees (see **Figure 30**). None of the respondents who drove to the site parked in an on-street parking space or found free parking at the site.

The respondents who drove and parked at the site were also asked what could cause them to shift travel modes from a private automobile to public transportation. 22 percent stated that there is nothing that could make them shift to public transportation and they will always drive and park, 56 percent stated that they would take public transportation if it was more convenient, and 22 percent stated that they would take public transportation if parking and driving became too expensive (see **Figure 31**). One respondent who indicated they would take public transportation if it was more convenient also chose "other," stating that they would switch to public transportation if it was cleaner.

Figure 30: Parking Fees

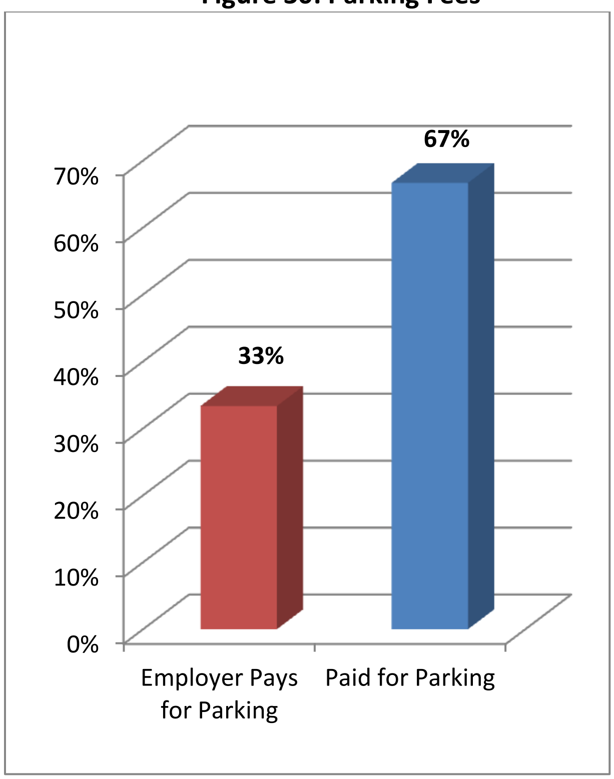
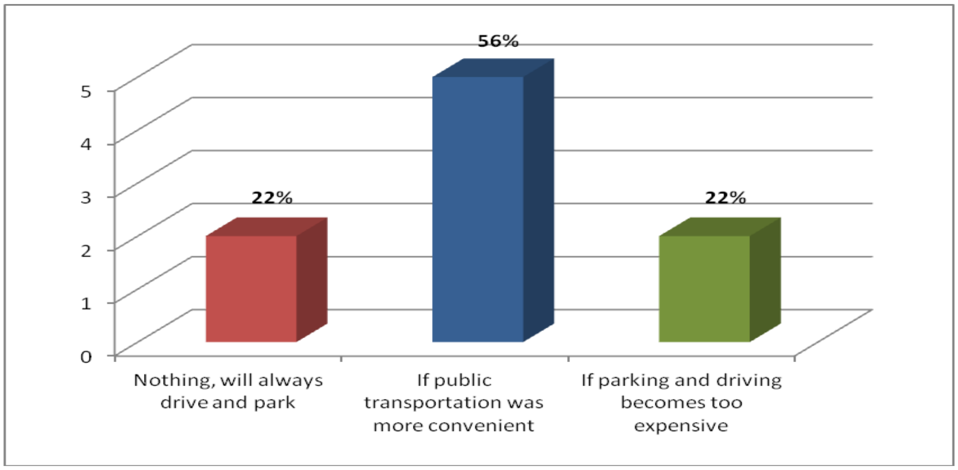


Figure 31: Causes to Shift to Public Transportation



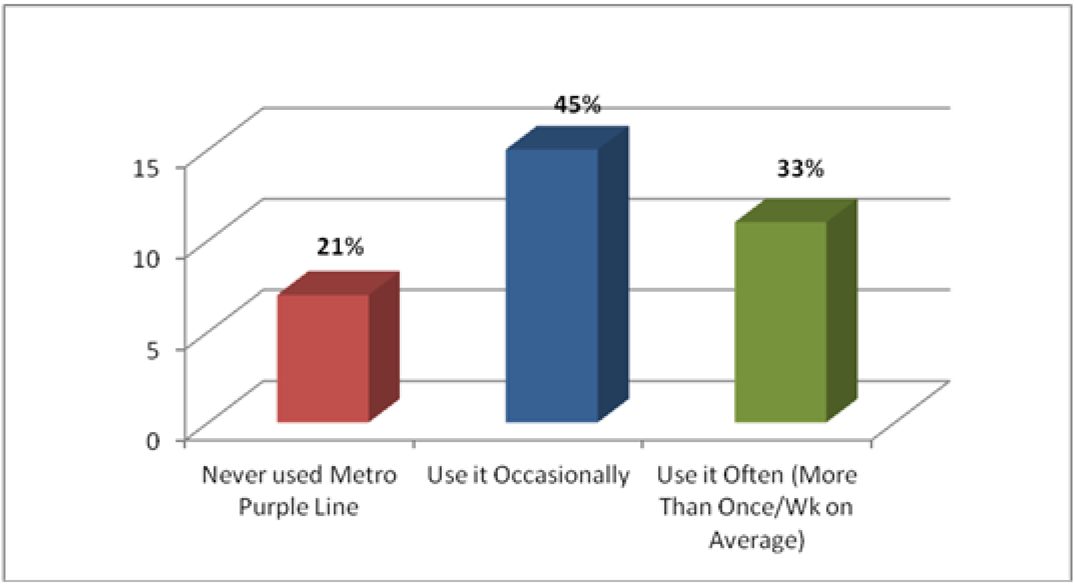
Survey Results for Respondents Who Took Public Transportation

Respondents who took public transportation were then asked what the primary factor was in deciding to take public transportation. Their response was split evenly, with one-half of the respondents stating that they always take public transportation because they do not own a car, the other half stating that they take public transportation because it is more convenient than driving a private automobile. None of the respondents stated that they take public transportation because driving is too expensive.

Utilization of Metro Purple Line at the Wilshire Boulevard/Western Avenue Station

The Metro Purple Line is one of five rail lines on the Los Angeles County Metro rail system and operates between downtown Los Angeles and Mid-Wilshire/Koreatown. Due to the close proximity of the Wilshire Boulevard/Western Avenue Purple Line station to the survey site, respondents were asked if they have ever used the Metro Purple Line at the Wilshire Boulevard/Western Avenue station. Of the respondents, 21 percent have never ridden the Metro Purple Line, 46 percent ride it occasionally, and 33 percent ride it more than once per week (see **Figure 32**).

Figure 32: Use of Metro Purple Line at Wilshire/Western Station



Cross Tabulations

Table 26 shows a cross tabulation table between travel mode and trip purpose. As shown, 75 percent of the respondents who were at the site for shopping purposes walked or biked, and 25 percent arrived via public transportation. These results indicate that among the people surveyed, those arriving at the site for purposes other than work are typically not driving a private automobile. Conversely, 50 percent who were at the site for work-related purposes arrived in a private automobile, 37 percent arrived via public transportation, and 13 percent walked, indicating that among those surveyed, half travel to work via public transportation or by walking.

Table 26: Travel Mode: Trip Purpose Cross Tabulation

			Trip Purpose							Total
			Work	Shop	Restaurant	Movie	Gym	Multiple	Other	
Travel Mode	Drove	Count	7	0	0	0	0	1	0	**8**
		% within Trip Purpose	43.8%	0.0%	0.0%	0.0%	0.0%	20.0%	0.0%	**24.2%**
	Passenger in Car	Count	1	0	0	0	0	0	0	**1**
		% within Trip Purpose	6.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**3.0%**
	Metro Train	Count	1	0	2	0	0	0	0	**3**
		% within Trip Purpose	6.3%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	**9.1%**
	Bus	Count	5	2	0	0	1	0	0	**8**
		% within Trip Purpose	31.3%	25.0%	0.0%	0.0%	100.0%	0.0%	0.0%	**24.2%**
	Walk	Count	2	4	0	0	0	4	1	**11**
		% within Trip Purpose	12.5%	50.0%	0.0%	0.0%	0.0%	80.0%	100.0%	**33.3%**
	Bike	Count	0	2	0	0	0	0	0	**2**
		% within Trip Purpose	0.0%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**6.1%**
Total		**Count**	**16**	**8**	**2**	**0**	**1**	**5**	**1**	**33**
		% within Purpose	**100.0%**	**100.0%**	**100.0%**	**0.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Table 27 shows a cross tabulation table between travel mode and the use of the Metro Purple Line station at Wilshire Boulevard/Western Avenue. The results show that of the nine respondents who drove, 22 percent have never used the Metro Purple Line at the Wilshire Boulevard/Western Avenue station and 78 percent either use it occasionally or more than once per week. This indicates that among those who drove to the site, over two-thirds of those surveyed have used the Metro Purple Line to get to their destination. Conversely, of the respondents who took the bus, 63 percent have never used the Metro Purple Line at the Wilshire Boulevard/Western Avenue station, indicating that bus transit is their mode of choice, and the Metro Purple Line is not a viable transportation alternative from their trip origin.

Table 27 : Travel Mode: and Use of the Metro Purple Line Station at the Wilshire/Western Cross Tabulation

			Use Metro Purple Line at Wilshire/Western Station			Total
			No, Never	Yes, Occasionally	Yes, Often (>1/Wk)	
Travel Mode	Drove	Count	2	4	2	**8**
		% within Use Metro Purple Line	28.6%	26.7%	18.2%	**24.2%**
	Passenger in Car	Count	0	1	0	**1**
		% within Use Metro Purple Line	0.0%	6.7%	0.0%	**3.0%**
	Metro Train	Count	0	0	3	**3**
		% within Use Metro Purple Line	0.0%	0.0%	27.3%	**9.1%**
	Bus	Count	5	3	0	**8**
		% within Use Metro Purple Line	71.4%	20.0%	0.0%	**24.2%**
	Walk	Count	0	6	5	**11**
		% within Use Metro Purple Line	0.0%	40.0%	45.5%	**33.3%**
	Bike	Count	0	1	1	**2**
		% within Use Metro Purple Line	0.0%	6.7%	9.1%	**6.1%**
Total		**Count**	**7**	**15**	**11**	**33**
		% within Use Metro Purple Line	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Chapter 7 – Recommendations

This project has revealed many interesting findings regarding City of Los Angeles TOD areas, their characteristics and the associated parking supply and demand. Available research points towards case-by-case solutions rather than area-wide or citywide blanket policies due to the widely varying characteristics of TOD areas, including parking fees, income levels, quality of transit service, variations in the built environment and many other factors. The information developed by the study can be used to guide further research as well as to point toward actions that can be taken at specific TOD locations in the City.

While the intent of the study overall was to provide information to the City to help staff start to formulate policies, some draft recommendations can be put forward based on the results of study including the research on best practices as well as the specific empirical studies conducted in the eight case study areas. Those recommendations are listed below.

- Focus further research on TOD areas with high parking utilization and higher parking fees – this study showed that these include Vermont/Sunset, Wilshire Western and Hollywood/Vine. These three TOD locations clearly stand out from the other five locations in nearly all aspects. They have higher rankings in most of the measured categories of importance including density, parking supply, parking demand, parking fees and level of transit usage. Further research could include additional case study locations with focused studies on the TOD areas in the City with the highest land use densities and highest transit ridership/transit services. It has been demonstrated that the characteristics of the chosen TODs vary significantly in terms of their land use and socioeconomic characteristics as well as their transit facilities and transit capacities. Future case study analysis should start with a screening of TOD locations to determine those with relatively higher land use densities, the appropriate mix of land uses (as shown per the research that result in more transit usage), and the highest available transit capacity or future planned transit capacity. Those locations will likely yield the greatest potential for parking policies and other policies to result in significant increased use of transit. Other areas of research could include more outreach and in-person surveys as well as more discussions with TOD area business operators to understand their current parking policies (free parking, charge for parking, level of parking fees, etc.) as well as their current transportation demand management programs (if any) and how they encourage employees and visitors to ride transit versus drive. More in-person surveys would be extremely valuable to understand not only the "numbers" (density, transit ridership, parking demand) but also why these areas have the characteristics that they exhibit.
- Work with major businesses in key TOD areas to better understand their opinions and programs relating to transit and parking, and also to help establish Transportation Management Organizations/Associations (TMO/TMA) around key TODs for the purpose of maximizing transit usage. In the Vermont/Sunset area, the study revealed some very important facts. First, the major employer near the TOD, Kaiser Hospital, does not charge employees for parking. This private corporate decision has been made for many reasons; however, it does not help to encourage the use of the nearby

transit services. Furthermore, while Kaiser has rideshare coordination services and a program to help encourage other modes, their program has been developed at the corporate level and is the same for each Kaiser campus regardless of its location or characteristics. Thus, there is not a focused and specific program for the major Sunset Campus which is located within the TOD. The program does not focus on a number of techniques that could help capture the maximum amount of transit utilization in this special urban core area that is relatively rich in transit services. Development of a TMO/TMA (or similar program) in this area would help facilitate measures that would target employees and visitors and reduce the usage of single person automobiles. This area has a parking shortage which could be partially mitigated via shifting trips to transit using parking policies and other programs to provide incentives to use transit and/or disincentives to automobile usage.

- Review parking standards for future development in areas with estimated parking surpluses. (Surplus defined as those areas per the parking demand model that showed more parking spaces available than theoretical parking demand based on land use intensity and associated built parking). The parking demand model revealed that Hollywood/Vine has a theoretical parking surplus on weekdays (but perhaps not during special events).
- Conduct more "in-person" studies/surveys to better understand resident, visitor and worker opinions regarding the relationship of parking and transit usage at TODs. While the data developed in this study is very valuable to start to understand the relationship between parking and transit in the TOD areas, it does not uncover the motivational factors behind travel choices in the TOD vicinity. More information is needed regarding why people choose to drive and park, even when they live or work in or near a TOD.
- Review City meter parking fee policies in TOD areas. The study revealed that three of the eight TOD locations have no on-street fees, and four of the remaining five have a lower meter rate of $1/hour. Only Hollywood/Vine has $2/hour meter rates. At the TOD locations with higher parking usage and parking shortages, variable peak usage time parking pricing could help to encourage transit usage. Under the current LADOT test program on variable meter pricing, fees could range up to $6/hour depending on how many cars are searching for spaces. This will help to prioritize on-street parking for short-term, visitor parking.
- Review other physical elements of the TOD/parking relationship such as the quality of sidewalks, lighting and perceived security. All of these elements contribute to the choice to drive versus taking transit. The "first and last" mile element is important to help understand the mode choice in these TOD areas and to supplement the parking supply/demand data.
- Work with Metro to review the feeder bus services and other amenities at key stations and to help understand how people get to the stations that do not live/work or drive and park in the areas. For example, Zipcars are currently available in the close proximity to some of the TOD locations, including Vermont/Sunset. Use of alternative modes or Zipcars could facilitate transit use without needing more parking at or near the TOD locations.

- Investigate shared use of parking in the TOD areas for both existing developments as well as future development projects. Review the potential to better utilize available parking and without further overbuilding parking. Shared use in association with parking maximums would help discourage overbuilding, lower building costs and help get people out of single passenger autos.
- At specific TOD locations, look into demand-based, locally-calibrated TOD parking requirements that reflect expected transit shares and automobile ownership in the particular TOD under consideration.
- Consider deregulation of parking in certain transit districts. This could include “loosening” of City parking code standards around certain TODs so that the city-wide standard is not automatically applied across the board throughout the City. Specialized and localized parking studies could be allowed or encouraged in various TOD areas which could be used to identify possible parking reductions for future developments based on specific criteria such as proximity to transit, land use intensity, land use mix, transit service availability/capacity, availability of transportation demand management programs, current area parking utilization (measured via utilization surveys) and other information what would help determine future parking needs. This could also be paired with parking “maximums” in certain areas; however, additional study is needed before such maximums could be specified. This puts decisions about parking supply for housing and offices in the hands of developers, who assess market demand and prices in determining the best use of capital.
- Partner with Metro and other transit agencies for shared station-area parking planning and supply. In the past, station area planning was not well coordinated between agencies, however with new programs and funds, the City and Metro and others are jointly looking at station area planning issues in much greater detail, and together. Make parking supply, demand and pricing a part of all future station area planning.
- Focus on TODs in lower income areas where the use of alternative modes is more likely and the auto ownership has been shown to be lower than higher income TOD locations.
- Consider encouraging <u>or requiring</u> unbundling of parking charges from space leases at selected TODs in agreements for residential and office developments.
- Consider encouraging <u>or requiring</u> employer tenants to cash-out parking in office developments.
- Design stations and station-area parking in a way that places housing and mixed-use development in convenient proximity to stations. Alignment and station location planning should consider how parking affects the walk-ability of the station vicinity and possibilities for shared parking.
- Review density standards in key TOD locations, with the understanding that research clearly indicates that the success of TODs is directly related to both density and mix of uses. Seek densities and mixes in the City’s land use plan that will encourage TOD success, such as shown in the study (based on empirical research minimum FARs over 1.0 and approaching 2.0 or greater have a more effect on trip reduction and thus transit ridership and associated decreased parking needs). Similarly, mixes of uses with 30 percent or more of area dedicated to residential within ¼ mile of a high quality transit node have a greater effect on TOD success in terms of reducing trips.

- Work with developers to align parking supply with actual demand when the parking is priced at its true cost. As noted in other recommendations, this could occur via the use of specialized parking studies that examine the local parking fee structure and local parking demand characteristics in TOD locations. A likely vehicle for this type of action would be Transportation Management Associations which encourage the use of appropriate TDM polices including parking fees as well as many other measures to encourage transit ridership. Research indicates that a strong deterrent to the use of single occupant automobiles for commuting is pricing parking at its actual cost with no hidden subsidies to employees and visitors. Despite this, such policies are still applied by many employers in the City. Also supply parking to average demand, not peak demand, using shared parking to accommodate demand peaks.
- Reducing parking requirements could result in a real economic benefit to developers as parking is very expensive to build in urban areas. Putting some of the savings into strategies to shift trips to transit in the TOD areas would be very effective as opposed to simply continuing to build "code" required parking. This should especially focus in the areas with the highest quality transit services, including the Vermont/Sunset, Wilshire/Western and Hollywood/Vine stations and other locations with similarly high ridership levels, as well in lower income TOD locations.
- The research indicates that TOD parking policies, including possible parking reductions, must be tailored to the unique site level characteristics. The data from this study provides some of the specific site level data. At each station where the City wants to consider specific policies, research is needed regarding:

    - Parking environment at the TOD, including parking capacity and parking costs
    - Parking availability
    - Walk access
    - Transit service quality.
    - Transportation Demand Management and the use of Transportation Management Associations to work with employers and developers to understand and implement appropriate policies related to parking cost, alternative transportation options, transit subsidies in lieu of paying for parking, rideshare programs, "ride at work" options and many other programs that have proven effective in encouraging people to use transit rather than drive themselves.

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Appendix A

Summary of TOD Research Documents

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
Promote Transit-Oriented Design						
Bacon, et. al., 1993	San Francisco Bay Area (Lafayette, and Rockridge area of Oakland BART station neighborhoods)	Urban, Suburban	Analysis of commute and shopping mode for Lafayette and Rockridge. Trip generation studies of 3 supermarkets in distinct settings: - Low-density single-family ½ mile from transit station (Lafayette) - Moderate density mixed-use 300 feet from rail transit station (Rockridge) - Moderate density mixed use ⅓ mile rail transit station (Rockridge)	Commute trips Super-market trips	BART mode split @ 20% both neighborhoods but Rockridge had - 20% lower drive-alone - 15% less use of auto for BART access Vehicular trip generation at supermarket near rail station 20% lower than ITE (low-density neighborhood) and 40% lower than ITE in moderate density/mixed use neighborhood next to rail station	Similar per capita income between neighborhoods Unclear why Lafayette site has 20% lower trip generation since BART mode split only 3.3% and walk/bike 0%.
Cervero, 1993	San Francisco and Los Angeles Regions	Suburban	Matched-pair analyses of pre-1945 neighborhoods (transit-oriented) and post-1945 (auto-oriented)	Commute	Controlling for income and density, transit-oriented neighborhoods have 1.4% higher transit mode split in LA and 5.1% higher in the Bay Area. Furthermore, transit neighborhoods, by and large, showed lower drive-alone modal shares and trip generation rates than automobile neighborhoods and average higher walking and bicycling modal shares and generation rates than their automobile counterparts. (Mode shares 3.3% higher in L.A., 6.6% higher in Bay Area)	Only work trips studied. Study attempts to control (with limited success) the level of transit service, so that land use and street patterns are primary independent variables.
Friedman, et. al., 1992	San Francisco Bay Area	Urban, Suburban	Comparison of trip generation and mode split data between Pre-World War II and Post-World War II commuter using 1981 MTC survey data.	All purposes	Pre-war neighborhoods exhibit 20% fewer total trips per household and 25% fewer auto driver trips. (no data presented on VMT)	No control for HH size auto ownership or income (income 23% less in older neighborhoods) Cannot isolate effect of different TOD components..

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
Cambridge Sytematics, et. al., 1992	Portland, OR	Suburban, Urban	Sophisticated model-based forecast based on 1985 travel survey and other information. Focuses on impact of TOD type development at regional and subregional scale.	All purposes	Regionally, TOD – LUTRAQ alternative reduces VT by 7.7% and VMT by 13.6% Within TODS: - 22% fewer home-based car trips. - >20% transit mode split compared to <10% in standard suburb.	
Middlesex-Somerset Mercer Regional Council, 1992	Central New Jersey	Urban, Suburban	Modeling study of Transit and Walking "Constructs." Modeling Parameters based on literature review and survey data.	All trip purposes	12% reduction in regional growth of VMT, 18% reduction in growth of vehicle trips. Transit construct (mixed use centered on a major rail or bus stop with a jobs/housing ration of 2.18 or more) reduces per capita vehicle use by approximately 28% and 32% peak and 25% off-peak compared to standard suburban.	NCHRP #323 (JHK, 1989) used to develop trip reduction factors
cervero, 1993	San Francisco and Los Angeles regions	Suburban	Matched-pair analyses of pre-1945 neighborhoods (transit-oriented) and post-1945 (auto-oriented)	Commute	Controlling for income and density, transit-oriented neighborhoods have 1.4% higher transit mode split in LA and 5.1% higher in the Bay Area. Furthermore, transit neighborhoods, by and large, showed lower drive-alone modal shares and trip generation rates than automobile neighborhoods and averaged higher walking and bicycling modal shares and generation rates than their automobile counterparts. (Mode shares 3.3% higher in L.A., 6.6% higher in Bay Area).	Only work trips studied. Study attempts to control (with limited success) the level of transit service, so that land use and street patterns are primary independent variables.

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SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
JHK, 1987 and 1989	Washington, D.C.	Urban, Suburban centers	Surveys of residents and officer workers near WMATA rail stations. Large projects (>75 DU) within one-third mile of station.	Work trips	As ≤1,000 feet from a rail station, transit mode splits (bus and rail) are approximately: - 50% for residents - 50% for downtown workers - 20% suburban workers (Rosslyn, Crystal City)	
Santa Clara County Manufacturing Group Housing, 1993 Survey	Santa Clara County	Suburban, Urban	Survey of housing preferences of 500+ high tech workers in Silicon Valley. Included several questions on commute preferences.	Commute	65% respondents stated they would use rail transit if located within ½ miles of both home and job.	
Stringham M., 1982	Toronto and Edmonton Canada	Urban	Study of 2,000 people living and working near rail transit stations.	Work and school	30-60 percent of all trips within 3,000 feet on station used rail transit. High-density residents 30% more likely to use rail at same distance.	

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
Cervero, 1993	California Rail Transit Stations (Bay Area, Sacramento, San Diego)	Suburban, Urban	Survey of residents at developments of $\geq$ 75 D.U $\leq$ ⅔ mile (most $\leq$ ⅓ mile of a rail transit station)	Major Trips (3 most important trips on the survey day, as defined by the respondents)	For all systems taken together: 15% of major trips by rail transit 12% other non-auto mode. Near BART 35.6% of trips are non-auto. This compares to 14% non-auto in California in 1991.	A very comprehensive and recent study. Includes summary analysis of rail station access in Washington DC and Canada. Parking charges at destination and greatly increase probability of rail use (Fig. 5.1 p. 93) Both Cervero and the JHK studies (see below) results indicate that proximity of both residence employment to rail stations are key.
Encourage Mixed-Use Development						

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
Colorado/Wyoming ITE, 1987	3 Colorado Cities	Suburban	Empirical study of mixed-use developments (newer auto-oriented) (double-check)	Shopping, personal business, work	8% actual trip reduction found at mixed-use centers compared to 25% predicted on basis of interviews. Article concludes that other additional trips would not have been made.	Although mixed use reduced daily trips less than expected at site, users of mixed-use centers can accomplish more with one trip, and may reduce their total travel on a weekly/monthly basis.
Ewing, Haliyur and Page, 1994	Suburban (Palm Beach County Florida)	Suburban	Six suburban communities. Travel behavior analyzed with respect to: - Trip frequency - Mode choice - Trip chaining - Trip length - Vehicle hours of travel Database is a 16,000 record database for Palm Beach County. (Sample size for communities not given.	All	Vehicle mode splits not dramatic across communities. Vehicle hours of travel (VHT) do appear to be affected. Four auto oriented suburbs had an unweighted average of VHT/capita of 3.42 West Palm Beach (traditional neighborhood) had 2.28 VHT/capita (-33%) while partly gridded and master-planned 1920's community had 2.8 VHT/capita (-18%)	Study concludes that communities "internalize as many facilities and services as possible". Promoting efficient auto-trips and auto tours (multi-stage chained auto trips) is important "where the auto reigns supreme".
Barton Aschman Associates, 1990	Raleigh-Durham NC	Urban, Suburban	Projective analysis of a proposed rail system based in part on Pushkarev and Zupan.	Rail transit		New rail transit requires 43 DU/acre within ⅛ mile and 10 DU/acre within the next ⅛ mile.

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
Pushkarev and Zupan, 1977	Nationwide with detailed data from the New York City region	Urban, Suburban	Empirical study of relationship between urban form and transit use. Two key variables identified: corridor residential density and activity center employment.	Transit trips (all purposes)	Between 7 and 30 DU/residential acre/transit usage triples for each doubling in density (Assumes at least one activity center with 5-10 million SF non-residential uses.	7 DU/acre in min. threshold for 40 buses/day; 15 DU/acre for 120 buses/day.
Urban Land Institute, 1983	Nationwide survey of 161 sites; 122 "suburban" 39 "CBD"	Suburban, Urban, CBD	Survey of employee regarding use of nearby facilities and services. Cross-sectional comparison of single-use vs. mixed-use sites.	Work, midday work-based trips	Mixing of uses increased the number of employees using nearby facilities from 19% to 28% to 61% in CBD.	Study a decade old but database is large (28,000 total questionnaires including non-employee user of sites.)
Frank, 1994	Seattle, WA Metropolitan area.	Urban Suburban	Analyses of database based on a transportation panel (survey). Census, employment and parcel-level land use data. Controlled for non-land use variables.	Work and shop trips by 3 modes. Single occupant vehicle (SOV), transit and walking.	Employment density reduces SOV and increases transit and walking, for both work and shop trips: population density increases walk trips (Work and shop) and transit trips (shops). Major decreases in SOV: occur. - At employment densities > 75/acre. At residential densities above 15 persons/acre (gross density).	A comprehensive study. Not all analysis is reported in this paper.

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
JHK & Associates, 1989	Nationwide	6 office and regional shopping centers, including Bellevue, WA (Regional center with 4.7 million ft office, 2 million ft retail/ commercial 1000 hotel rooms)	Development of a database of travel characteristics for large-scale, multi-use suburban activity centers.	Commute Mid-day	Primary trip purpose is shopping for midday trips (46-84%) and P.M. peak trips. Relatively high transit share at Bellevue attributable to "extensive radial bus system" (17 bus route and transit center) The larger the center, the greater the percentage of internal trips (31-47% evening and midday). The more office space at a center, the greater the number of office-origin trips to the center. Automobile is the dominant mode, even for internal trips. Bellevue, with good transit service and design for pedestrians, had significantly higher shares of transit (7% versus 1%) and midday walk trips (25% versus 16%) than the other SACs.	Study concludes midday non-auto use and office proximity highly related. Trip generation rates tended to be lower than ITE estimates for all uses. For office, rates per square foot were lower than ITE rates, but rates per employee were higher, suggesting that employee densities are lower in SACs.

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
Holtzclaw, 1990	San Francisco Bay Area	Urban, Suburban	Empirical analysis of neighborhoods in San Francisco, Oakland (Rockridge) Walnut Creek and Danville, using CA DMV Smog chick mileage readings.	Total VMT (no trip data)	Doubling density results in per capital VMT reductions of 20-30%.	Author sites similar studies in Toronto, Chicago and elsewhere which support basic relatively of a 20-30% reduction in VMT for each doubling in density.
Middlesex Somerset Mercer Regional Council, 1992	Central New Jersey	Urban, Suburban	Modeling study of Transit and Walking "Constructs." Modeling parameters based on literature review and survey data.	All trip purposes - Daily - Peak - Off-peak	Major urban growth in employment and households, combined with the suburban constructs, reduces the growth in total trips by nearly 20 percent. Without that type of urban growth – meaning it is absorbed into the suburban constructs – the overall growth in regional trips is reduced by only 10 percent. Similar differences occur for VMT.	
Encourage Infill/Densification						
Middleton, 1990	Portland, OR	Urban esp. downtown	Summary descriptions of effects of LRT and land use developments since 1970's		Number of autos entering downtown unchanged despite 30,000 new jobs 43/5 work, 26% all day transit mode split in downtown (No "before" data)	

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
Dumphy and Fisher, 1993	Nationwide	Urban Suburban, Rural.	Analysis of 1990 NPTS residential density categories	Person Trips Vehicle Trip VMT	Generally confirms Holtzclaw's findings, except density increases at lowest levels (from 1,300 to 2,700 persons/sq. mi.) has no effect.	Authors note that density is associated with other factors (e.g. auto ownership. Good transit)
Frank, 1994	Seattle, WA Metropolitan area.	Urban, Suburban	Analysis of database based n a transportation panel (survey) Census, employment and parcel-level land use data. Controlled for non-land use variables.	Work and shop trips by 3 modes. Single occupant vehicle (SOV) transit and waling.	Employment density reduces SOV and increases transit and walking, for both work ad shop trips: population density increases walk trips (work and shop) and transit trips (shop). Major decreases in SOV: occur. - At employment densities > 75/acre. - At residential densities above 15 persons/acre (gross density).	A comprehensive study. Not all analysis is reported in this paper.

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
JHK & Associates, 1989	Nationwide	6 office and regional shopping centers, including Bellevue, WA (Regional center with 4.7 million ft office, 2 million ft retail/commercial, 1000 hotel rooms)	Development of a database of travel characteristics for large-scale, multi-use suburban activity centers.	Commute Mid-day	Primary trip purpose is shopping for midday trips (46-84%) and P.M. peak trips. Relatively high transit share at one center attributable to "extensive radial bus system" (17 bus route and transit center) The larger the center, the greater the percentage of internal trips (31-47% evening and midday). The more office space at a center, the greater the number of office-origin trips to the center. Automobile is the dominant mode, even for internal trips. Bellevue, with good transit service and design for pedestrians, had significantly higher shares of transit (7% versus 1%) and midday walk trips (25% versus 16%) than the other SACs.	Study concludes midday non-auto use and office proximity highly related. Trip generation rates tended to be lower than ITE estimates for all uses. For office, rates per square foot were lower than ITE rates, but rates per employee were higher, suggesting that employee densities are lower in SACs

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
Markovitz in Gilbert, 1974	New York City Region	Urban, Suburban	Empirical study of trip generation rates. (Cross-sectional comparison of areas with clustered and unclustered land uses).	All	Residential trip generation reduced by 65% due to clustering. Non-residential trip generation reduced by 45%	No VMT data
Develop Concentrated Activity Centers/Strengthen Downtowns						
Colorado/Wyoming, ITE, 1987	3 Colorado cities	Suburban	Empirical study of mixed-use developments	Shopping, personal business, work	8% actual trip reduction found at mixed-use centers compared to 25% predicted on basis of interviews. Article concludes that other additional trips would not have been made.	Although mixed use reduced daily trips less than expected at site, users of mixed-use centers can accomplish more with one trip, and may reduce their total travel on a weekly/monthly basis.
Encourage Jobs/Housing Balance						
Cervero, 1988	Nationwide	Suburban	Empirical analyses of 57 large centers. Effects of density and other land use also considered.	Commute and mid-day travel	3 to 5% more trips by walking, cycling and transit. J/H balance creates shorter commutes discourage ride-sharing and transit (if service is infrequent)	Cities other studies by Giuliano (1991) that simple jobs-housing balances do not translate directly into mobility benefits.

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
Middlesex Somerset Mercer Regional Council, 1992	Central New Jersey	Urban, Suburban	Modeling study of Transit and Walking "Constructs." Modeling parameters based on literature review and local survey data.	All trip purposes: - Daily - Peak - Off-peak	Major urban growth in employment and households, combined with the suburban constructs, reduces the growth in total trips by nearly 20 percent. Without that type of urban growth meaning that it is absorbed into the suburban constructs – the overall growth in regional trips is reduced by only 10 percent. Similar differences occur for VMT.	This study suggests that urban infill is twice as efficient in trip and VMT reduction as well-designed new suburban centers, but also notes scarcity of data on urban trip making.
Urban Land Institute, 1983	Nationwide survey of 161 sites; 122 "suburban" 39 "CBD"	Suburban, Urban, CBD	Survey of employee regarding use of nearby facilities and services. Cross-sectional comparison of single-use vs. mixed-use sites.	Work, midday work-based trips	Mixing of uses increased the number of employees using nearby facilities from 19% to 28% in suburban areas and from 29% to 61% in CBD.	Study a decade old but database is large (28,000 total questionnaires including non-employee user of sites), no information on whether or not trips would have been made elsewhere if no nearby destinations.
Middlesex Somerset Mercer Regional Council, 1992	Central New Jersey	Urban Suburban	Modeling study of Transit and Waling "Constructs."	All	"Waling Construct" modeled in this study showed an 18% - reduction in Daily VMT. (more in peak, less in off-peak)	Walking construct features some bus transit and a low jobs/housing balance (0.14).

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
Untermann, 1984	U.S.	All	Empirical studies of American walking behavior	All	Proportion of Americans willing to walk: 500' most (70%) 1,000' 40% 2,600' 10% (longer for work and other "crucial" trips)	Pleasant/interesting environment can perhaps double distance willingly walkers. Walkers tend to be young and female.
Promote Pedestrian-Oriented Design						
Bacon, et. al., 1993	San Francisco Bay Area (Lafayette, and Rockridge area of Oakland BART station neighborhoods)	Urban, Suburban	Analysis of commute mode spent for Lafayette and Rockridge. Trip Generation studies of 3 supermarkets in distinct settings:	Commute trips Supermarket trips Commute (work) trips	BART mode split @ 20% both neighborhoods but Rockridge had - 20% lower drive-alone - 15% less use of auto for BART access Walk mode split at Rockridge supermarkets: 11.1% - 12.5% (Bike: 0 – 2.5 %)	Similar per capita income between neighborhoods Unclear why Lafayette site has 20% lower trip generation since BART mode split only 3.3% and walk/bike 0%

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
Ewing, Haliyur and Page, 1994	Suburban (Palm Beach County Florida)	Suburban	Six suburban communities travel behavior analyzed with respect to: - Trip frequency - Mode choice - Trip Chaining - Trip length - Vehicle hours of travel	All	Vehicle mode splits not dramatic across communities. Vehicle hours of travel (VHT) do appear to be affected. Four auto-oriented suburbs had an unweighted average of VHT/capita of 3.42 West Palm Beach (traditional neighborhood) had 2.28 VHT/capita (-33%) while party gridded and master-planned 1920's community had 2.8 VHT/capita (-18%)	Study concludes that communities "internalize" as many facilities and services as possible promoting efficient auto-trips and auto tours (multi-stage chained auto trips) is important "where the auto reigns supreme".
Parking Statement						
Aarts and Hammk, 1984	King County	Suburban	Testing whether ridesharing decreases the demand for parking.	Work	Finding show that it is the limited parking supply that leads to ridesharing rather than ridesharing decreases demand for parking.	The result of this study is consistent with other studies.
Dowling, 1991	San Francisco	Urban	Study of mode share at San Francisco Hospitals as related (by regression) to parking pricing and supply.	Work	Pricing explains most variations in mode share (elasticity of about 1 at 50-55 dollars per month), but supply off-site is also important. About 1/3 as "strong" as price according to a regression.	Parking supply appears to be important even independent of pricing.

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
Gentvoort, 1984	Netherlands	Urban		Work	When a parking lot closed SOVs dropped by 16% while transit increased by 17.5%, carpooling increased by 3% and there was no impact on bicycle trips.	The survey was given before and after the lot was closed and in the short run emissions & VMT were high because of SOV driving around looking for parking.
Golob, 1988	Irvine, CA (UCI)	Urban	Parking fees were increased for both student and faculty of the University of California Irvine.	School/ (UNIV) work	A 10% reduction of students' permits might mean a reduction in VT/VMT and emissions.	Students were more price sensitive than faculty to the increase in parking fees.
Integrated Street Networks						
Friedman, at.al., 1992	San Francisco Bay Area	Urban, Suburban	Comparison of trip generation and mode split data between pre-World War II and Post-World War II commuter using 1981 MTC survey data.	All purposes	Pre-war neighborhoods exhibit 20% fewer total trips per household and 25% fewer auto driver trips. (no data presented on VMT). Also, pre-war had 12% walk trips and 4% bike (versus 8% and 2% in post-war areas).	No control for HH size auto ownership or income (HH income 23% less in older neighborhoods) Cannot isolate effect of different TOD components.
Kulash, 1990	Florida	Suburban	Modeling study of grid vs. cul-de-sac dominated street networks.	All	43% reduction in VMT at community scale due to more direct routes.	Trips that go beyond community less affected.

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
White Mountain Survey, 1991	Portsmouth, New Hampshire	Suburban, Urban	Trip Generation study	All	Study found the average daily traffic (ADT) generated by these neighborhoods to be about 50 percent lower than the ADT predicted by the *ITE Trip Generation Manual.*	No control for income, HH size, vehicle ownership.
Gross, W.P., et.al.	Massachusetts	Suburban	Parking fees were increased on and around campus, and parking supply was decreased.	School/Work	The actual impact came from the reduction of parking spaces rather than parking pieces.	Since 79% of the survey respondents still chose lots based on convenience rather than pricing (while supply was somewhat limited) VMT and VT were not reduced much.
Higgings, 1982	Calgary, Sacramento, Davis, Montgomery County, Phoenix, Palo Alto, Bellevue, Portland, Seattle.	Urban	Study of participating code policies allowing reductions in required parking in return for developer TOM action or in-lieu fees.	Work	Few developers opt for reduced minimums.	“Flexible” parking requirements are not a reliable planning option to encourage less parking supply.
Keyani and Putnam, 1976	Pittsburgh	Urban (CBD)	A 3 day strike of parking garage operators closed 80% of Pittsburgh parking lots.	Work/Work Related	Transit ridership was up to 75% and peak period CBD traffic declined by 25%	When parking supply is limited, mode split is likely to occur.

<table>
<tr><th>SOURCE</th><th>LOCATION</th><th>AREA TYPE</th><th>DESCRIPTION</th><th>TRAVEL TYPE</th><th>IMPACTS</th><th>COMMENTS</th></tr>
<tr><td>Kulash, 1974</td><td>San Francisco</td><td>Urban</td><td>An increase of parking charges by 10-25%, at the same time an increase in transit services.</td><td>Work
Shopping</td><td>Work related elasticity:
An overall price elasticity on the basis of # of automobiles is about -0.3 (i.e. level of demand for parking is inelastic.)</td><td>Commuters were more likely than shoppers to shift to new travel modes to avoid increased parking fees.</td></tr>
<tr><td>Mehranian, et. al.,</td><td>Los Angeles</td><td>Urban</td><td>The study examined parking management of two downtown LA companies. Company A provides only subsidy for parking while Company B has incentive and rideshare programs.</td><td>Work</td><td>Company B had a higher percent of carpool/vanpool than Company A. However, SOV was almost the same:
<table>
<tr><th></th><th>Firm A</th><th>Firm B</th></tr>
<tr><td>SOV</td><td>49%</td><td>48%</td></tr>
<tr><td>Carpool/ Van</td><td>20%</td><td>34%</td></tr>
<tr><td>Transit</td><td>31%</td><td>18%</td></tr>
</table></td><td>The authors noted that Firm B has a lower transit share due to the fact that Firm B's incentive programs may be shifting transit users into carpools rather than shifting SOV's to other modes.</td></tr>
<tr><td>Miller and Everett, 1982</td><td>Washington, D.C.</td><td>11 Urban sites
4 Suburban</td><td>A "before and after" study of federal and private employees who were charged additional parking fees for commute trips.</td><td>Work</td><td>Urban:
- SOV decreased by 2-5%
- Transit increased by 1-3% while carpooling decreased

Suburban:
- SOV decreased by 2%
- No change in carpooling & transit
- A 3% increase in "other modes" (walking, biking, etc.)</td><td>Overall, the largest shifts were among lower income groups. Note that transit increased as a result of decrease in carpool. Usually the reverse is true.</td></tr>
</table>

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
Miller and Higgins, 1983	San Francisco, CA Washington, DC; Ottawa, CA; Seattle, WA; Santa Cruz, CA.	Mostly Urban	Study of parking taxes, rate increases, surcharges, and carpool discounts across several cities.	Walk	Parking tax brings uneven results, but -0.3 overall long term parking price hike increases short term parking in Chicago: peak period surcharge shifts parkers among parking facilities in Madison: Auto usage decreased 20% in Ottawa after free parking ended for government employees.	Pricing can reduce auto use, but also can increase short term parking and shift parker locations.
Olsson and Miller, 1978	Seattle, WA	Urban	Free parking was given to employees using HOVs in Seattle, WA.	Work	22% of respondents had driven alone prior to using the lots. 40% had used transit and 38% carpooled.	The monetary incentive was not the main reason for changing their mode, since most of the employees already had highly subsidized parking.
Pickrell and Shoup, 1980	Los Angeles UCLA	Urban	When parking permits were denied to students, they found alternatives to SOVs. However, as soon as they were offered parking permits they switched from rideshare to SOV.	School (University)		Although SOV students did not park on campus, they were still likely to drive alone and park away from campus.
Transport Canada Report # 291, 1978	Ottawa	Urban	When parking fees were levied of federal employees, transit ridership increased up to 7.3%.	Work	This study suggests that parking supply, has a greater impact on rideshare mode than pricing.	

SOURCE	LOCATION	AREA TYPE	DESCRIPTION	TRAVEL TYPE	IMPACTS	COMMENTS
Willson, 1992	Los Angeles	Urban	Analysis of reduced or removed parking subsidy effects, including both case studies and model projections.	Walk	Based on Los Angeles data, elasticity of demand for solo driving relates to parking price is about minus,2 to minus.3 at average daily costs of 3 to 4 dollars.	
Zarka and Krail, 1987	Seattle	Urban	Survey of 12 downtown buildings as to correlation between price and supply and mode share.	Walk	While higher priced parking is associated with more transit use, tighter supply also appears to encourage additional transit use.	Study based on very limited number of cases and is cross-sectional, not time series.

Appendix B

Summary of TOD Case Studies

Research Case Study Examples

The following case studies from other areas will be instructive in carrying out the present study and formulating sound TOD parking policies for the City of L.A.

San Diego

The Institute of Transportation Engineers (ITE) Parking Generation, using a national database of parking studies summarized observed parking demand for many land uses. This example is from the study that was done for the urban areas of the San Diego region. After comparing typical city code values, the Parking Generation demand is shown to be lower than the existing parking supply in the San Diego region for the three different land use types. The parking supply is approximately 100 percent higher than the parking demand in residential areas and about 50 percent higher in the office areas.

Table A1: Parking Demand vs. Existing Supply, San Diego

<table>
<tr><th rowspan="2">Land Use</th><th colspan="2">Estimated Parking Demand[1]</th><th colspan="2">Current parking Supply Rates
in San Diego Area</th></tr>
<tr><th>Urban</th><th>Suburban</th><th>Lowest</th><th>Average</th></tr>
<tr><td>Residential Multi-Family[2]</td><td>1.00</td><td>1.20</td><td>1.25</td><td>1.75-2.50</td></tr>
<tr><td>Office[3]</td><td>2.40</td><td>2.84</td><td>3.33</td><td>3.60</td></tr>
<tr><td>Retail[3]</td><td colspan="2">2.65-3.76</td><td>3.30</td><td>4.00</td></tr>
<tr><td colspan="5">Notes:
1. Residential, Office, and Retail rates from ITE Parking Generation (using LUCs 221, 701 and 820)
2. Rate is per dwelling unit
3. Rate is per 1,000 square feet of leasable area
Sources: Fehr & Peers, 2009. ITE Parking Generation, 3rd Edition, 2004.</td></tr>
</table>

Source: Lee, 2010.

Pacific Court (Long Beach)[31]

Pacific Court is a mixed-use, infill development in urban Long Beach. It was completed in 1992 and contains 142 apartments and 96,000 square feet of retail and commercial development. The area is served by light rail transit every five to 10 minutes.

The developer successfully negotiated with the City to eliminate a guest parking requirement through a variance process, and to reduce the retail parking ratio from five to two spaces per 1,000 square feet due to good transit access.

[31] The Caltrans report cites the following sources for the case study:
Robert ZurSchmiede, Long Beach Redevelopment Agency, Long Beach
Gary Felgemaker, Community Planning Manager, City of Long Beach

The Caltrans report states that "parking appears to be sufficient but not excessive,"[32] with 400 underground parking spaces on-site and several additional lots in the area operated by the Redevelopment Agency.

Pleasant Hill[33]

The Pleasant Hill Bay Area Rapid Transit (BART) station area contains 411,000 square feet of office, 40,000 square feet of retail, and 350 apartments and townhouses. The 18.8-acre site is part of a larger TOD established 20 years prior. It is served by heavy rail every five to 10 minutes during peak hours and every 15 minutes during off-peak hours.

The ratio for office parking was reduced from five to 3.3 spaces per 1,000 square feet, and the ratio for retail parking was reduced from five to four spaces per 1,000 square feet. This was achieved partly through the strategy of establishing shared parking between hotels and office uses. The residential parking ratio was also reduced from 1.75 to 1.35 spaces per unit.

Earlier developments in the larger TOD that used office parking ratios of 2.6 to 2.8 spaces per 1,000 feet were found to be under-parked at times, whereas developments with 3.3 to 4.0 spaces per 1,000 feet have sufficient capacity and have even been able to lease some excess capacity to transit patrons on a monthly basis.

Dadeland South (Miami)[34]

The Dadeland South development in suburban Miami consists of three office buildings and two hotels, containing a total of 500,000 square feet of office and 605 hotel rooms. The TOD is served by light rail every five minutes during peak hours and every 15 minutes during off-peak hours, and it is served by bus every 10 minutes.

The County's Transit Zone ordinance allows for the negotiation of project-specific development standards in station areas. In this case, the ratio for office parking was reduced from one space per 250 square feet to one space per 400 in the TOD, while hotel parking in the TOD remained at the standard ratio of one space per two rooms. The developer was ultimately forced to exceed the negotiated minimum standards in order to meet tenant requirements.

One parking garage in the development was jointly built and now jointly owned by the developer and the rail operator, Metrorail, thus reducing total construction cost. However, transit and office patrons must generally be kept in separate sections of the lot because they are charged different prices.

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[32] California Department of Transportation, 2002; p. 33.

[33] The Caltrans report cites the following sources for the case study:
Jim Kennedy, Deputy Director, Contra Costa County Redevelopment
Patty Hirota Cohen, Project Manager, BART

[34] The Caltrans report cites the following source for the case study:
Frank Talleda, Joint Development and Leasing (Chief), Miami-Dade Transit Agency

Arlington, VA – RB Corridor (Orange Line) and J.D. Corridor (Blue Line)[35]

The case study area consists of multiple stations along two suburban corridors. The stations are served by rail every 6-7 minutes during peak hours. The corridor contains 30.3 million square feet of office, 3.5 million square feet of retail, 22,000 residential units, and 189,000 jobs.

All TODs in Arlington undergo a "special exception"[36] permitting process, which sometimes results in reduced parking requirements if past development experience justifies such a reduction.

In these case study TODs, the office parking ratio was reduced from one space per 250-300 square feet to one space per 580 square feet, and the hotel parking ratio was reduced from one space per room to 0.7 spaces per room. In addition, the residential parking ratio for high rises was reduced from one 1 1/8 spaces high-rise unit to one space per unit and a new requirement of two spaces per unit was implemented for townhouses.

In general, parking appears to be sufficient. Although there have been complaints about insufficient parking for visitors, parties, and deliveries, parking supply appears to be sufficient at least for residents themselves. There is no minimum parking ratio for retail, and some retailers choose not to provide parking at all, which has caused some "operational problems."[37] Paid parking garages, which operate as separate businesses, often do not provide sufficient convenient parking for retail in mixed-use buildings, and they often close after office users leave but while many retailers are still open.

Hollywood/Highland[38]

This Los Angeles TOD is a major 8.7-acre entertainment and retail complex, including a hotel, a multiplex theater, and a 3,300-seat theater. It is served every 10 minutes by heavy rail (Red Line), as well as bus. The site includes a 3,000-space underground parking structure.

Local parking requirements range from 2 to 4 spaces per 1,000 square feet for commercial uses. Although no special parking standards were implemented for the TOD per se, parking requirements in redevelopment areas were reduced to 2 spaces per 1,000 square feet for office and retail uses, under the assumption that less parking was needed in blighted areas.

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[35] The Caltrans report cites the following source for the case study:
Robert E. Brosnan, Planning Division Chief, Arlington County Department of Community Housing and Development

[36] California Department of Transportation, 2002; p. 47.

[37] California Department of Transportation, 2002; p. 48.

[38] The Caltrans report cites the following sources for the case study:
Kevin Michel, Project Manager, Metro Transit Authority, Los Angeles
Kip Rudd, City Planner, Los Angeles Community Redevelopment Agency

The project was completed in 2001, though no research was identified that evaluated the subsequent success of the modified parking standards specifically.

Uptown District (San Diego)[39]

This 14-acre urban mixed-use TOD located in a major transit corridor served by several bus routes every 15-30 minutes. Completed in 1989, the site includes a 42,500 square-foot market, a 3,000 square foot community center, and 320 dwelling units.

The developer negotiated with the City to reduce parking requirements from one space per 250 square feet to one space per 285 square feet for commercial uses. The standard residential parking requirement of 2.25 spaces per unit applied. The developer ultimately constructed a total of 1,068 parking spaces, none of which were provided specifically for transit riders.

Parking in the TOD is reportedly "not a problem,"[40] and some two-bedroom households have been known to rent out the second space they are provided.

Reston Town Center (Virginia)[41]

The planned suburban community of Reston is served by bus every five to 10 minutes, connecting to the Washington, DC Metro system. The community contains a mixed-use "core" that includes 1.3 million square feet of office, retail, and hotel uses.

Following negotiations with Fairfax County, a Shared Parking Agreement was reached which requires shared parking among all tenants and prohibits the pricing of parking by property owners. This arrangement allowed for a reduction in required Town Center parking from 4,066 to 3,063 spaces. The County and developer agreed to a further reduction four-year "trial" reduction to 2,800 spaces for a four-year period. After no parking shortage was observed during the trial period, which ended in 1998, the County allowed the reduction to 2,800 spaces to become permanent.

The shared parking agreement and the mix of uses in the Town Center, rather than access to transit, have reportedly been the keys to parking reduction in Reston. The area is highly walkable and pedestrian-oriented. Still, some peak-hour shortages have been reported for particular uses, such as restaurants during lunch hour.

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[39] The Caltrans report cites the following sources for the case study:
Miriam Kirshner, City Planning Liaison to MTDB, San Diego
Michael Stepner, Dean New School of Architecture & Design, San Diego
Bill Liben, resident of Uptown District since 1992, San Diego

[40] California Department of Transportation, 2002; p. 36.

[41] The Caltrans report cites the following source for the case study:
Mark Looney, Real Estate Associate, Cooley Godward, LLP

The Yards at Union Station (Portland, OR)[42]

This 7-acre 650-unit urban residential project is located in "a redeveloping area of surplus rail yards and underutilized industrial properties,"[43] near the downtown Portland Transit Mall. It is served by bus and light rail every five to 10 minutes.

The project has a total of 277 spaces – 197 structured and 80 on-street – which are rented to residents. The developer was unable to achieve the intended parking ratio of 0.75 spaces per unit due to the discovery of contaminated soils. As a result, 4 percent of the units could not be rented due to lack of parking, and many tenants park off-site "at higher expense and/or greater inconvenience."[44]

Mockingbird Station (Dallas)[45]

This mixed use development includes a hotel, 211 loft apartments, 140,000 square feet of office space, and 180,000 square feet of retail, theater, and restaurants. It is served by two light rail lines, with combined peak frequency of five minutes, as well as regional bus lines.

Although the city does not grant parking reductions based on transit proximity, the developer was able to negotiate parking reduction credits for shared-use, allowing a reduction from 2,200 spaces to 1,600 spaces. Parking is shared for most land uses in the development, and the final negotiated requirements are as follows:

- Residential: 1.16 space/unit
- Office: 3 spaces/1,000 square feet
- Retail: 4 spaces/1,000 square feet
- Hotel: 1 space/room

RIO VISTA WEST (SAN DIEGO)46

[42] The Caltrans report cites the following source for the case study:
Tillman Richter, GSL Properties, Portland, Oregon

[43] California Department of Transportation, 2002; p. 52.

[44] California Department of Transportation, 2002; p. 52.

[45] The Caltrans report cites the following source for the case study:
Ken Hughes (developer), UC Urban

[46] The Caltrans report cites the following source for the case study:
Nancy Bragado, Senior Planner, City of San Diego
Chris Kluth, Transportation Planner, MTDB, San Diego

This 95-acre suburban mixed-use development includes 1,700 housing units, as well as small office and neighborhood retail uses. It is served by light rail every 15 minutes.

San Diego applies reduced parking requirements to developments that, like Rio Vista West, are located at least partially within a Transit Area Overlay Zone or Urban Village Overlay Zone. Although 2.0 spaces per unit are still required for single family units, parking ratios are reduced from 1.25 to 2.25 to 1.0 to 2.0 spaces per 1,000 feet for multiple family dwellings. In addition, required parking for retail and commercial uses is reduced from 2.5 to 5.0 to 2.1 to 4.3 spaces per 1,000 square feet, and the ratio is reduced from 2.5- to 15.0 to 4.3 to12.8 spaces per 1,000 square feet for eating and drinking establishments.

The Rio Vista West development contains 970 parking spaces on the mixed-use portion of the site. Most of these spaces are located in underground facilities.

MOFFETT PARK (SUNNYVALE, CA)47

This 26-acre project was originally envisioned as a cluster of offices surrounded by parking lots. However, in order to qualify for an increased FAR, the developer modified the proposal to a "more transit supportive design," described in the Caltrans report as " buildings clustered along a walkway leading to the new Tasman West light rail line immediately adjacent to the property. The walkway features open spaces with fountains and seating."[48]

The developer negotiated a parking ratio of one space per 310-320 square feet of office space. Standard parking ratios in industrial/R&D/office zones range from one space per 250 square feet to one space per 500 square feet.

FRUITVALE TRANSIT VILLAGE (OAKLAND, CA)49

This mixed-use inner-city redevelopment project, on a site that was formerly a BART parking lot, contains residential, retail, and office uses, as well as a library, children's center, and senior center. The project is served by heavy rail every five to 10 minutes and bus every 12 to 30 minutes during peak hour.

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[47] The Caltrans report cites the following source for the case study:
Grieg Asher, TOD Program Manager, Valley Transportation Authority, San Jose
Trudi Ryan, Planning Director, City of Sunnyvale
Paul Spence, Associate Planner, City of Sunnyvale

[48] California Department of Transportation, 2002; p. 39.

[49] The Caltrans report cites the following source for the case study:
Peter Albert, Manager, BART Planning/San Francisco and West Bay, Oakland
Patty Hirota Cohen, Project Manager, BART Real Estate, Oakland
Evelyn Johnson, Project Director, Fruitvale Development Corporation
A support corporation of The Unity Council, Oakland

The City of Oakland passed a special transit village zoning overlay ordinance for the developer that eliminated the retail parking requirement altogether (the standard requirement was one space per 200-900 square feet) and reduced the residential parking requirement from one to two spaces per unit to 0.5 spaces per unit.

The developer also worked to help secure county and state funding for BART to construct replacement parking capacity at a nearby site to compensate for the parking lost to the TOD.

LINDBERGH CITY CENTER (ATLANTA) 50

This project in suburban Atlanta includes office space within the Metropolitan Atlanta Rapid Transit Authority (MARTA) headquarters building and office space owned by BellSouth Corporation, along with 105 residential condominium units, 316 apartment units, restaurants and retail establishments, and a 175-room hotel. The site is served by heavy rail every 4-8 minutes and by bus every 8-32 minutes.

The special parking requirements developed for this project were the product of "an extended series of facilitated negotiations that included MARTA, its selected developers, City of Atlanta Planning, and representatives of five, surrounding, residential neighborhoods."[51] The resulting set of parking requirements for the project, as compared to standard requirements, is summarized in the Caltrans report as follows: [52]

[50] The Caltrans report cites the following source for the case study:
Scott Pendergrast, Senior Development Specialist, MARTA

[51] California Department of Transportation, 2002; p. 49.

[52] California Department of Transportation, 2002; p. 49.

Standard:

1, 2, 3. 3.3 parking spaces per 1,000 square feet of office space

4. 5.0 parking spaces per 1,000 square feet of retail space, and 10.0 parking spaces per 1,000 square feet of restaurant space
5. 1.0 space per condominium bedroom
6. 1.0 space per apartment bedroom
7. 1.0 space per hotel guest room, plus 0.5 space per employee

TOD:

1. MARTA HQ = 1.0 parking space per 1,000 square feet of office space
2. BellSouth offices = 2.34 spaces per 1,000 square feet
3. Speculative office space = 2.67 spaces per 1,000 square feet
4. Retail/restaurant space = 3.7 spaces per 1,000 square feet of floor area
5. Condominiums = 1.85 spaces per residential unit
6. Apartments = 1.0 to 1.5 spaces per residential unit
7. Hotel = 0.5 spaces per guest room

Table A2: TOD Parking Reduction Case Studies

Transit-Oriented Development	Land Use	Parking Reduction	Experience
Pacific Court (Long Beach, CA)	Retail	60%	Parking sufficient but not excessive
Pleasant Hill BART (CA)	Office	34%	Parking sufficient, leasing excess spaces to BART
	Retail	20%	
Dadeland South (Miami, FL)	Office	38%	Excess capacity in office garages
Arlington, VA (2 corridors)	Office	48%-57%	Parking sufficient
	Residential	11% (high-rise)	Parking sufficient for residents.
	Hotel	30%	Parking sufficient
Source: California Department of Transportation. "Statewide Transit-Oriented Development Study: Parking and TOD: Challenges and Opportunities (Special Report)," 2002.			

Source: Lee, 2010 (except Arlington, VA, incorporated from California Department of Transportation, 2002.)